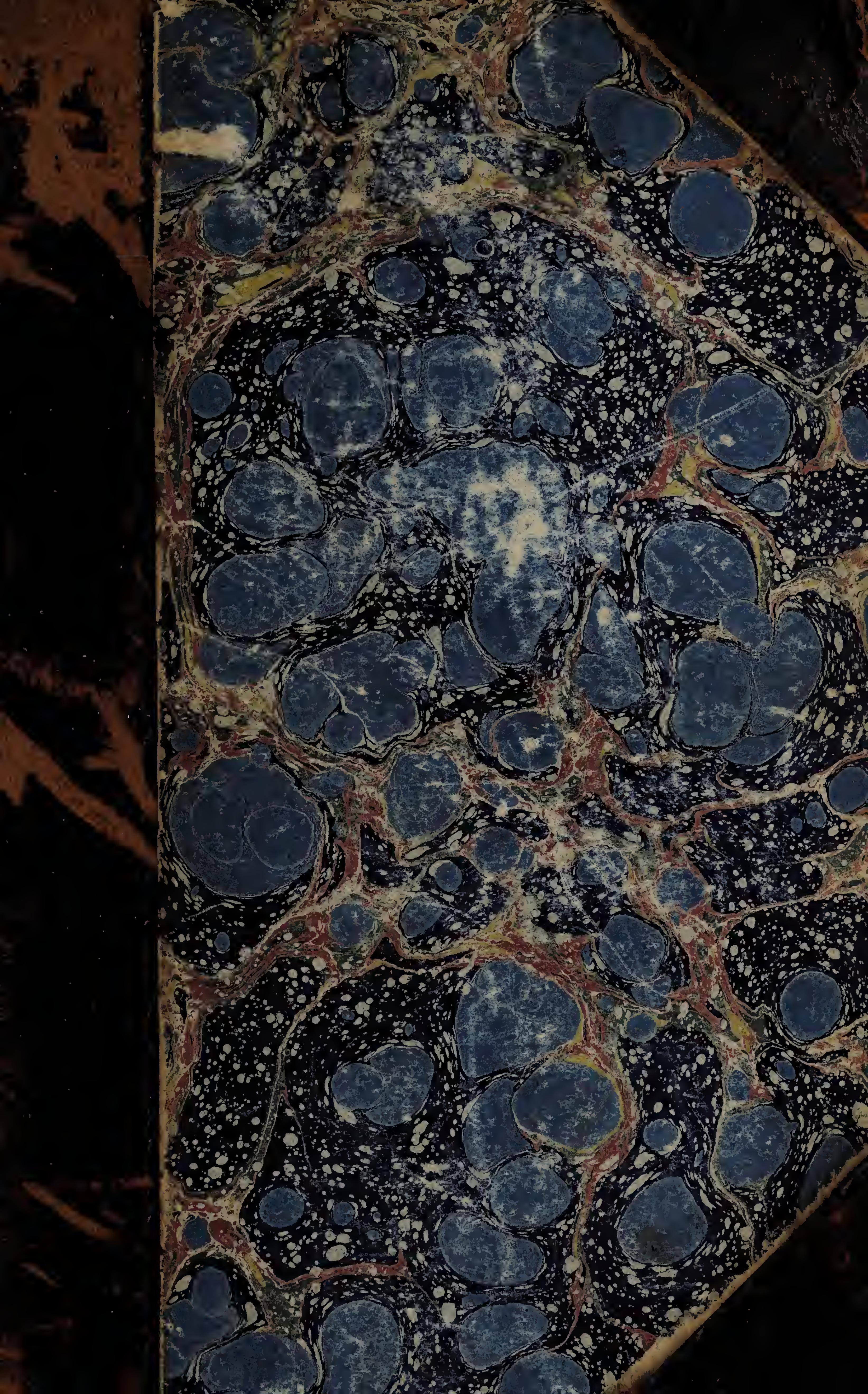

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BEAUMARIS.

THE CRUISE

OF

THE NELLY.

Summer Wanderings

OF A

MARINE ZOOLOGIST.

ON THE

COASTS OF THE BRITISH ISLANDS.

BY BENJAMIN HOOPER,

Member of the Dublin Natural History Society; Author of "Stray Leaves."

? 1871

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THE CRUISE OF "THE NELLY."

CHAPTER I.

"Blest be the gracious power who taught mankind
To stamp a lasting image of the mind!
Beasts may convey, and tuneful birds may sing
Their mutual feelings in the opening spring;
But man alone has skill and power to send
The heart's warm dictates to the distant friend;
'Tis his alone to please, instruct, advise,
Ages remote and nations yet to rise."

CRABBE.

ZOOPHYTOLOGY.

IT is curious experience to glance through the pages of some magazine or other periodical of comparatively recent date, and to observe the enormous difference which the lapse of even a few years makes, not only in our manners, and habits, our customs, the hours we keep, our mode of travelling, and the like, but also in the style of literature of the higher kind which the taste of the age demands, and which those who live by catering to that taste, as a matter of course, employ.

At the present day a profound and elaborate treatise on any branch of Zoology is only read by the learned and scientific members of society; the general reader demands something more than mere scientific books, knows nothing of such works, and cares much less (no matter how interesting and instructive the subject may be) if it is not written in what is termed the *popular style.* Our great Conchologist, Jeffreys, truly observes, that "it cannot be denied that novels, magazines, and newspapers, constitute now-a-days the literature which chiefly occupies the small reading time of the public, and that scientific books generally are overlooked unless they advance some startling proposition as to the original or remote antiquity of our own race. There can be no use, however, in blaming the popular taste, nor would it be reasonable to expect that every one should follow a scientific path if his inclinations do not lead that way. The love of nature is not confined to any one period, and its votaries must not feel disappointed should their peculiar studies not be shared by all their contemporaries."

The late Dr. W. H. Harvey, of Dublin, the author of one of our most delightful sea side books, remarks, "That the writers of the middle ages had built up in their own minds a perfect system, as it was supposed; and this they imagined to be the system of the universe. Instead, therefore, of seeking out by patient observation the facts of Nature, and reasoning upon them, they employed themselves in cutting down to their own notions of propriety every fact which seemed to contradict what the schoolmen considered a law of Nature. A glaring instance of such prejudiced explanation is found in the theories, gravely put forward by learned men, to explain the existence of organic fossils. Marine petrifactions—fishes, shells, corals—were found embedded in rocks, or in the soil, in places far removed from the existing sea, and at a considerable height above its level, in the upland country, and even on the tops of mountains. The wise men of those days (so late as the year 1860) explained the phenomena by supposing a 'plastic power' in Nature which was exerted in moulding the living rock into mimic representations of animals and plants for no better purpose, seemingly, than to puzzle and amuse the vulgar. This was cutting the knot of the difficulty after a strange fashion. It was contrary to their theory to believe that the sea had ever occupied the places in which the marine productions were found. If it had not, how could these have got there? There was no reply, but the resolute denial that the fossils were really the relics of marine creatures; and this in spite of the evidences of their senses, or the deductions of sound reason, these pseudo philosophers unblushingly asserted. It was thus the facts of nature were habitually twisted to suit the requirings of a preconceived theory, and thus laborious lives were spent to no other purpose than in heaping up a mass of unreadable nonsense in our libraries.

"The renunciation of the inductive philosophy was the first great blow to the fame of these writers. The perfect system of the universe was found to be no longer tenable; it fell almost at the first onset, and with it fell the charm which had embalmed every opinion handed down from classic times. The Book of Nature began to be studied with ardour, and in a new and unfettered spirit. No longer clogged with theories, naturalists found that so far from its having been exhausted by the labours of their predecessors, Natural History was full to overflowing of novel interest. Facts were no longer tried by traditional authority; but tradition was subjected to close inquisition of newly observed facts. In every country observers were at work, and instead of the somnambulism of the preceeding ages, naturalists, like men newly risen, went forth in their morning strength and ardour to the labours of the day The fair sun of science was already above the horizon, and it was their privilege to drink in his earliest beams."

If we glance only over the list of books by our own biologists of the present and past generation, we shall see how particularly fortunate is the British amateur naturalist in possessing a series of admirable monographs, copiously illustrated by figures on each of the several zoological sciences, so that whatever tribe he wishes to study he can have the advantage of consulting a carefully written systematic work, which places that particular tribe before him, and gives him all the striking points of the history of the animals composing it, so far as they are known to naturalists. Yarrell's History of Birds and Fishes; Couch's Fish and Zoophytes of the British Seas; Forbes' Starfishes, and Madusæ; Forbes and

Hanley's History of British Mollusca and their Shells, J. Gwyne Jeffrey's British Conchology; Bell's Crustacea; Johnson and Hinck's Zoophytes; Gosse's British Sea Anemones and Corals; Alder and Hancock's Nudibranchiate Mollusca; Williams' British Annelides. These need no commendation, and present to the student a series of text books such as no other country possesses.

"So long," says Harvey, "as Natural History was encumbered with its pseudo classical incubus, its votaries were few in number. The more it grew into a science founded on observation, the more it attracted popular attention. The writings of LINNÆUS, composed in a clear and elegant style, offering a systematic arrangement such as all could readily understand, contributed more than those of any other naturalist to the spread of a taste for his favourite science. He was eminently a popular writer, and no matter what criticism may now be passed on his system, it must be admitted that to it is greatly owing the rapidity with which the natural sciences advanced in public favour in the early part of last century. Had his followers possessed a tithe of his comprehensive and singular penetrating mind, they would have preserved his memory from many an undeserved reproach. No man ever had a truer eye for a natural group, or was more deeply impressed with the value of a natural system. He has, indeed, left us in his Genera, especially of *Insects* and *Shells*, grand outlines of such a system, sketched by a master's hand. But he felt that the time for erecting the temple of Nature had not come, and that his own province lay in preparing materials for the building, and to this task he devoted the chief energies of his mind." And has there not in our own land sprung forth from time to time a band of skilled, indefatigable, willing workmen, able to grapple with the crude materials he left, and complete the noble edifice? The historical fictions of Sir Walter Scott, and the genius and eloquence of Macaulay have contributed much to render the domestic and political history of our country *popular*. Ellis, Montague, Carpenter, Forbes, Gilbert White and his Natural History of Selborne, Charles Kingsley's Glaucus, P. H. Gosse and his Rambles; and a host of others have contributed not only to render the works of nature *popular*, but instructive and delightful. One of our sea side naturalists, to whom I shall have frequently to refer, gently rebukes the enthusiasm created by the introduction of ocean gardens, and the sea anemones, but we will take his own words: "Since the British mind was all alive and trembling with the zoological fervour excited by the appearance of the hippopotamus in Regent's Park, no animal has touched it to such fine issues and such exuberant enthusiasm as the lovely sea anemone now the ornament of countless drawing-rooms, studies, and back parlours, as well as the delight of innumerable amateurs. In glass tanks and elegant vases of various devices, in finger glasses and common tumblers, the lovely creature may be seen expanding its coronal of tentacles on mimic rocks, amid mimic forests of algæ, in mimic oceans of pump water and certain mixtures of chlorides and carbonates regulated by a specific gravity test. Fairy fingers minister to its wants, removing dirt and slime from its body, feeding it with bits of limpet or raw beef; fingers, *not* of fairies, pull it about with remorseless curiosity of science, and experiment on it according to the suggestion of the moment. At once pet, ornament, and subject for dissection, the sea anemone has a well-established popularity in the British family-circle; having the advantage over the hippopotamus of being somewhat less expensive and less troublesome to keep. Were sea-cows as plentiful as anemones one could not make pets of them with the same comfort. There would be objections to *Potty* in the drawing-room. There would be embarrassments in the commissariat. There would be insurgents among the domestics; for the best tempered Jane might find it impossible to endure the presence of such a pet, and might resolutely refuse to bring up his water or clean out his crib, whereas, although the red-armed Jane thinks you a little cracked when you introduce 'them worm things' into your house, she keeps her opinions within the circle of the kitchen, and consents to receive her wages without a murmur.

"It is difficult to say what occasioned this enthusiasm for Anemones: lovely indeed, but by no means the most lovely, and certainly not the most interesting wonder of the deep. Mr. Gosse, by his *pleasant* books, and Mr. Mitchell by his tanks in the Regent's Park Zoological Gardens, have mainly contributed to the diffusion of the enthusiasm; and now that the enterprise has made a commercial branch of it, we may consider the taste established for at least some years." *

Mr. Gosse's pleasant books—they are more than pleasant—need no eulogium from my pen. Undoubtedly they have contributed, greatly contributed, to an earnest love for creatures placed on the lowest steps of life; a sincere desire to study those things that refine and purify our best feelings. Call it *enthusiasm*, a *mania*, a sea anemone fever that has infected society, if you like, we can have no objections so long as such admirably written and instructive works issue from the press, and more than hold their own in antagonism with the sensational rubbish we meet with now-a-days; we say, *content*; those we wish to instruct will say so likewise. I must now pass from the literature of Zoophytology to a brief sketch of its past history.

"When the word 'Zoophyte' began to be used by naturalists, it designated a miscellaneous class of beings which were believed to occupy a space between the animal and vegetable kingdoms, met, and were intermingled. They were of a middle nature, not because of their outward resemblance to plants, but because they were deficient in the more obvious qualities of animals. Almost insensible and immotive, their weak and obscure life was regarded as one of merely vegetation engendered in them by putrefaction or fermentation, and unsusceptible of the volitions and passions which move and agitate higher entities. Thus the term indicated a mingled life or constitution, and had no reference to figure, but some time after, when it had been allowed on all hands that the productions in question were altogether animal, another class of objects, hitherto registered amongst vegetables, was ascertained to be also of animal origin; and as their similitude to mosses and lichens, to sea weeds and mushrooms, was undeniable, and indeed so remarkable as to have long veiled their nature from us, then the term 'Zoophyte' was transferred to this newly-discovered order, and has since been applied by the majority of English naturalists to it alone. With continental naturalists the word has still its widest application, embracing in their nomenclature not merely those polypherous beings which cover the bottom of the ocean with a singular exact mimicry of vegetation, but also the star fishes and sea urchins, the sea figs and sea nettles, or jelly fish, and even the intestinal worms." But Dr. G. Johnston regrets this wide acceptation of the word on the score of verbal accuracy, and as opposed both to Zoological and vulgar usages, using it in a more restricted sense than either Ellis or Solander, removing even sponges from the category, and in the same sense it will be adopted in these pages. "The definition of Zoophyte is thus considerably simplified, but there still remains sufficient variety of structure in the constituents of the order to render that definition vague, and perhaps practically useless. Zoophytes are all aquatic, arvertebrate, inarticulate, soft, irritable, and contractile, without a vascular or separate respiratory or nervous system. The alimentary canal is very variable, but the aperture to it is always superior circular edentulous, and surrounded by tubular, or more commonly by filiform tentacula. Many are asexual, and it is doubtful whether any species has distinct sexes. The individuals (Polypus) of a few families are separate and perfect in themselves, but the great majority of Zoophytes are compound animals, viz, each Zoophyte consists of an indefinite number of individuals or polypes organically connected, and placed in calcareous, horny, or membraneous cases or cells, forming by their aggregation corals or plant-like Polypidoms.

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* Lewis' Sea Side Studies.

As thus defined, our Zoophytes are referable to two of the primary divisions of the animal kingdom,—the Radiated and the Molluscan—and consequently constitute two classes distinguished by a very remarkable disimilarity of organization. These classes have been named Anthozoa, and Polyzoa, and may be characterized thus: *

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* Johnston, Brit. Zoo., P. I.

"I.—Anthozoa. Body tending to globular contractile in every part, symmetrical; mouth and vent one; gemmiparous and oviparous.

II.—Polyzoa. Body elongate, syphonal, non-contractile, and unsymmetrical; mouth and anus separate; oviparous."

Our knowledge of Zoophytes under any form previous to 1727, when the discoveries of Jean Andrew Peyssonnel were first communicated to the Academy of Sciences in Paris, was very limited. They were considered the undoubted subjects of the vegetable kingdom; naturalists being obviously led to this allocation of them by their aborescent appearances, in which it were vain to trace any likeness to any common animal forms,—and by their permanent fixedness to the objects from which they grow; for Zoophytes are attached by means of a disc, or tubular fibres, much in the same way that marine plants are, while the capability of moving at will from place to place was deemed to be the principal character of distinction between the two classes of animated beings. "The Zoologist," says Johnston, "claimed none of them, if we except the Actinia, or animal flowers, for his province and study, but left them without dispute to botanical writers, and if any of these, in reference to a very few Zoophytes of the least aborescent character, hazarded a whispered conjecture that they were wrongly classed, it died away in the utterance, and raised no echo to awaken further enquiry." To Peyssonnel we are undoubtedly indebted for the first true knowledge of the animality of these wonderfully constructed creatures, and not only the history of his extraordinary discovery, but the manner of its reception by the learned body to whom it was first communicated, the opposition with which it was met by the then learned naturalists, is so truly interesting, and so admirably given by Dr. G. Johnston, that I cannot resist giving much longer extracts than my present space would consistently permit.

"Some time previously to the publication of Peyssonnel's discovery, those who maintained that the stony Zoophytes were plants, had received a strong corroboration of their opinion from the elaborate researches of the Comte de Marsigli, who, having detected the existence of polypes in coral and madrepore, had, under the influence of the fashionable theory, described them as being literally their blossoms or flowers. Peyssonnel, therefore, had to contend not only against the prejudices of the vulgar, based on appearances which spoke direct to the outward senses, but against the actual observations of a naturalist of acknowledged merit; and the counter observations of Peyssonnel, although numerous and unequivocal, were mixed up with so much that was fanciful or erroneous, that it is not wonderful his opinion was received with coldness and suspicion. Réaumur, to whom his communication was entrusted, even concealed the name of the author when he laid it before the Academy, with the benevolent intention, doubtless, of shielding him from the scorn and ridicule that might possibly be the lot of one who had ventured to contradict the observations of an Italian count, and to oppose the established belief; and he immediately afterwards read before the same academicians an essay of his own, in which he opposed the theory of Peyssonnel with numerous objections, and attempted to explain the growth of coral in accordance to the admitted principles of vegetable physiology.

"The memoir in which Peyssonnel originally proposed his doctrine s not appear to have been published, and the only account there is of it is contained in the essay of Réaumur just alluded to. He maintained that what Marsigli had described as the blossoms of coral, were true animals or insects, analogous to the Actinia, or sea anemones; that the coral was secreted in a fluid form by the inhabitant Actina, and became afterwards fixed, hard, and changed into stone, and that all other stony sea plants, and even sponges, are the work of different insects peculiar to each species of these marine bodies, which labour uniformly according to their nature, and as the Supreme Being has ordered and determined. Réaumur remarks, that these opinions were not entirely the offspring of fancy. It would have been more candid and just had he said they were simply the convictions of a practical naturalist, who had long and patiently studied the productions in question in their native sites on the coasts of France and Barbary. Peyssonnel had seen the polypes of coral and of the madrepores, he recognised their resemblance to the naked animal flowers; he had witnessed their motions,—the extension of their tentacula, and the contraction and opening of the oral aperture; he ascertained that, unlike flowers, they were to be found the same at all seasons, that their corruptions exhaled the odour; their chemical analysis discovered the constituent principles of animal matters, and that the stony part of them exhibited no trace of vegetable organization, and opinions deduced from such data, abstracting his analogical reasoning of no value, and little applicability, might have been sufficient to have attracted at least some attention, had his opponent been less influential, or his own reputation and rank somewhat greater.

"The name and doctrine of Peyssonnel lay in this manner unknown and neglected until the remarkable experiments of Abraham Trembley, in 1741, on the reproductive powers of the fresh water polypes, and more especially his discovery of the Plumatella itself, a plant-like animal production, while they extorted the wonder and admiration of every one engaged in the study of natural science, were the means of recalling to the recollection of Réaumur the views of Peyssonnel, and he now came forward in promoting such inquiries as seemed likely to confirm and extend them. He himself appears to have repeated the experiments of Trembley, and had opportunity of observing the habits of the Plumatella, and, as he remarks, since the number of species of animals which are covered by the waters of the sea is much greater than that of the fresh waters, so it seemed natural to presume that not only would polypes be found in the ocean, but in greater numbers and variety than in ponds and rivers or rivulets. To ascertain the validity of this conjecture, and to settle, if possible, the discrepancy between the observations of Marsigli and Peyssonnel, his friends, Bernard de Jussieu and Gueitard, proceeded, in the autumn of 1741 and 1742, to different parts of the coasts of France, with the view of examining their zoophytical productions, and both were soon satisfied of the truth of the animal theory. Bernard de Jussieu in particular shewed that it was equally applicable to many Zoophytes which Peyssonnel had not examined, and whose animality had not been suspected, viz.: the flexible and delicate *Sertulariæ*, the *Flustra*, and the *Alcyonium* or *Lobularia;* the last of which seems to have excited much astonishment by the protrusion of its thousands of polypes of a size large enough to be seen and examined at ease with the naked eye.

The memoir which Jussieu presented to the Academy of Science in Paris is short but characterized by great distinctness and precision in the detail of his observations, and illustrated with excellent figures—his aim being evidently not to entrap our blind assent by declamatory display of the new wonders opened up in science, but to prove his conclusion to be the true one in the eye of reason and sobriety. He limits his descriptions and remarks to four species, viz.: *Alcyonium Digitatum*; *Tubularia, indivisa*; *Flustra folicea;* and *Cellapora pumicosa;* which seem to have been selected as examples of the more remarkable tribes, for it is evident that he had examined many more, but his observations on them were reserved for another memoir.

Réaumur's advocacy of the new doctrine was in a more popular style, but not less excellent. He gave a short exposition of the ascertained facts; reviewed with the clearness of an eye witness the discoveries of Trembley; pointing out their relations to the experiments of Jussieu and Gueitard, and how they mutually lent and borrowed strength; palliated and explained away his former opposition to Peyssonnel, and declared his complete faith in the animality of Zoophytes, and his convictions that a numerous list of productions hitherto unexamined would be found to be of the same nature.

"All that we have said," he thus concludes, "of the polypes of the sea is merely a sort of advertisement, which, however, cannot fail to produce the effect we promise ourselves from it; it will direct undoubtedly the curiosity of naturalists who reside by the sea to insects so worthy of being better known. They will seek out the different species; they will delight to describe to us the varieties presented in their forms never but remarkable; they will study the figure and disposition of the cells of the various species, their manner of growth and reproduction, and wherewithal they are nourished; they will, in short, place in a clear light everything that has reference to the different polypidoms and their formation, so that a department of natural history so interesting, so new, and as yet only sketched in outline, may be rendered as perfect as it merits to be."

This appeal, eloquent as it was, and from one having great influence, was, however, made in vain; for, whether from the inveteracy of habit, or our fondness of opinions long cherished, or from the fewness of the published observations whence the general conclusions were drawn, it seems certain that the new doctrines were everywhere received with doubts and suspicion, and beyond the immediate sphere of the Parisian academy excited apparently so little interest that no one was induced to enter into a practical examination of them. Such is perhaps the most important phase in the early history of Zoophytes; the first great effort to establish their true nature.

"The progress of truth," continues Johnston, "although it may be delayed by opposition, cannot be permanently arrested. The converts to the new doctrines were indeed few, but much had been done to facilitate their future reception, for the slumber of prejudice had been broken; the hold on the ancient opinions on the affections had been loosened, and men no longer startled into scepticism when they heard of animals that in their productions mimicked the most beautiful and delicate vegetable forms."

Peyssonnel doubtless severely felt the contempt with which his practical researches and examinations had heen received by the Parisian Savants; with the hope of a more favourable reception, he sent, in 1752, a treatise on coral, and other marine productions, to the Royal Society of London. At first it created a favourable impression, but before the members of the Society had an opportunity of testing the matter by personal observation, a dogmatic, plausible, blustering naturalist, Dr. Parsons, a man of great influence and some reputation, met the new theory with the most determined and uncharitable opposition.

He did not pretend to have tested the doctrines of Peyssonnel by any experiments or observation, but he choose to consider the animals in the corals as mere accidental settlers, totally inadequate to the great works ascribed to them. "And, indeed, it would seem to me," he says, "much more difficult to conceive that so fine an arrangement of parts, such masses as these bodies consist of, and such regular ramifications in some, and such well-contrived organs to serve for vegetation in others, should be the operations of little, poor, helpless, jelly-like animals, rather than the work of more sure vegetation, which carries on the growth of the tallest and largest trees with the same natural influence as the minutest plant."

Nor was Dr. Parsons the only opponent; the mineral theory had also its advocate in Henry Baker, who, about the same period, shot his last arrow. Still there was no actual observation; the war of words and opinions were carried on; first one and then the other theory claiming the victory. But, in this instance, it was won by an extraordinary man—JOHN ELLIS, a London merchant, whose history points a lesson to every student of Natural History. Our great zootomist, Dr. G. Johnston, presents a delightful sketch of his character and writings, collected from various original manuscripts, and the correspondence of Linnæus and other naturalists. "Ellis," he says, "devoted his leisure to the study of Natural History, in which he attained so considerable knowledge as to gain easy access to the Royal Society, and the acquaintance and correspondence of the most celebrated naturalists of his time. He seems to have attached himself more particularly to the economical department of botany, and seized every opportunity to introduce foreign plants to our gardens, especially such as were remarkable from furnishing any material employed in the arts and manufactures, and he was equally solicitous to acquire and diffuse accurate information relative to any natural productions which might be rendered subservient to the necessities of mankind. He was fond also of amusing himself in making imitations of landscapes by the curious and skilful disposition of delicate sea-weeds and corallines on paper, and it was this amusement that directed his enquiries into the nature of the latter, for, attracted by their beauty and neatness, he was induced to examine them minutely with the microscope, by the aid of which he immediately perceived 'that they differed not less from each other in respect to their form than they did in respect to their texture, and that in many of them this texture was such as seemed to indicate their being more of an animal than vegetable nature.' These 'suspicions,' as he modestly terms them, were communicated to the Royal Society in June, 1752, and, encouraged by some of the members, he prosecuted this enquiry with such ardour and care and sagacity that, in August of the same year, he had fully convinced himself 'that these apparent plants were ramified animals in their proper skins or cases, not locomotive, but fixed to shells of oysters, mussels, &c., and to Fucus's.'"

About 1755 was published his "Essay towards a Natural History of the Coralline and other Marine Productions of the like kind commonly found on the coasts of Great Britain and Ireland." "A work," says Dr. G. Johnston, "so complete and accurate, that it remains an unscarred monument of his well-earned reputation as a philosophical inquirer, and is even to this day the principal source of our knowledge in this department of Natural History. In several essays presented subsequently to the Royal Society, and published in their Transactions, he continued to illustrate and extend his opinions, and defended them so successfully against his opponents, that they soon came to be very generally adopted."

Ellis taught no novel doctrine; it was the same that had been maintained by Peyssonnel, Trembley, and latterly by Réaumur; but he gave it fixidity and currency, and he moreover applied it to those very Zoophytes which possessed the vegetable appearance in the most perfection, many of which he was the first to notice, and which he illustrated with a series of figures of unequalled accuracy. He showed, in those Zoophytes of a compound nature, that, though a single animal inhabited each cell, yet they were united "by a tender thready line to the fleshy part that occupies the middle of the whole coralline; that polypes were originally connected with the cells and could not remove from them; and that that which seemed plants was the covering, whether stony or calcareous, of the hydra, and was as much an animal structure as the nails of a man, the horns of a bullock, or the shell of a tortoise."

The discussion rested here, and Zoophytes, including the sponges and corallines, have been ever since enumerated among the subjects of the animal kingdom, although some, among whom Spallanzani may be particularized, continued in the belief that the corallines and sponges were vegetables. But naturalists continue to be divided in opinion relative to the nature of acknowledged Zoophytes, for many, of whom Bory de St. Vincent may be considered the chief, still continued to speak of them as intermediate beings, partaking of a two-fold nature, while others, under the leading of Bruguière and Lamarck, defend their claims to animality.

No new doctrine has been promulgated, neither indeed has the old been defended or attacked by any other facts or arguments than those already referred to, and with these facts before me, I cannot hesitate to give my assent to the opinion of Ellis. No one denies that the polypes, considered abstractedly from their polypidoms, are really animals; their quick and varied movements; their great irritability; the existence of a mouth and stomach; the nature of their food, its digestion, and the evomition of the indigestible remains are incontestible proofs of this; and it seems improbable, to say no more, that this animal should be fitted round with a case that grew independent of it from a different cause. And the case itself has no analogy, as Ellis showed very clearly, either to bark or to wood; it possesses the structure of neither of them, nor is it formed in the same manner by the addition of concentric layers, nor does it contribute to the formation of new parts, but, like the shell of testaceous mollusca, it is extravascular, and when once formed, suffers no other change than what external injuries or time may operate. If possible, its coincidences with the skin of cellular plants are even fewer; the one is a living part, which has very important functions to perform in relation to the plant itself, and to the atmosphere or circumfluent medium in which it lives; the other exhibits no action characteristic of life, and is nothing more than a condensed albuminous or calcareous sheath, appropriated solely to support or protection."*

I need not pursue the history of Zoophytolgy further. A long interval from the publication of Ellis's memoirs expired and naturalists made no sign. In 1828 we had an important work by Professor John Fleming, and at the expiration of another ten years, Dr. George Johnston's standard work, "The History of British Zoophytes," to whom I am indebted for my knowledge of its past history, and many of the preceding observations are the result of his research and investigations. The late Professor Harvey, speaking of Gilbert White's beautiful book, "The Natural History of Selborne," wonders how he found such ample materials within the bounds of a single country parish for one of the "most delightful and instructive books on natural history ever written;" and adds, it does not require to be located in a peculiarly favoured district to discover sufficient to arrest the attention of the observant naturalist, or even add something to the general stock of knowledge. The naturalist is more independent of circumstances than most men. Give him fields and hedges, the barren moor or the quarry, from each and all he will collect a store of useful and entertaining facts. No part of the country is so absolutely barren that it will not afford employment to the cultivation of some department of natural history, and employment of that nature that will keep his mind pleasantly and profitably occupied in the midst of most complete retirement. One, therefore, wonders that a taste for natural history is not the universal accompaniment of a country life. But, if a country life naturally leads us to contemplate the objects of creation with which we are surrounded, how much more does a residence on the sea coast attract us into the fields of observation! The numerous marine watering-places which are thronged in the summer and autumn months, ought to be so many schools for naturalists. Placed on all our coasts, they offer the greatest variety of aspect and climate that the limited shores of the British islands can supply. The sheltered bay, the open strand, the bold rocky barrier against which breakers constantly roll, each has its peculiar animal and vegetable inhabitant, and each variety of shore is more or less perfectly represented in one or other of our watering places. By visiting different parts, therefore, of the coast in succession, year by year, we may investigate, to the greatest advantage, the productions of the sea. *These are never exhausted; and once that an interest in the pursuit is awakened, it never flags.* There is no need to import the winter resources of cities—balls, parties, and theatrical representations—to the watering-places. Half the year ought to suffice for these amusements. Let the summer and the sea-shore preserve their native pleasures undisturbed." But how will this pleasant and truthful pen-picture meet the views of those whom Charles Kingsley anticipates are going down, perhaps by railway, to pass their usual six weeks at some watering-place along the coast, and whom we also anticipate to meet with frequently during the Cruise of our Nelly, "and who, as they roll along, think more than once, and that not over cheerfully, what they shall do when they get there. Now, half-tired, half-ashamed of making one more in the "ignoble army of idlers" who saunter about the cliffs, and sands, and quays, to whom every wharfe is but a "wharfe of Lethe" by which they rot dull as the oozy weed. You foreknow your doom by sad experience. A great deal of dressing, a lounge in the club-room, a stare out of the window with a telescope, an attempt to take a bad sketch, a walk up one parade and down another, interminable reading of the silliest novels over which you fall asleep on a bench in the sun and perhaps have your umbrella stolen; a purposeless fine weather sail in a yacht, accompanied by ineffectual attempts to catch a mackerel, and the consumption of many cigars, while your boys deafen your ears and endanger your personal safety by blazing away at innocent gulls and willocks, who go off to die slowly, a sport which you feel in your heart to be wanton, and cowardly, and cruel, and yet cannot feel in your heart to stop, because "the lads have nothing else to do, and, at all events, it keeps them out of the billiard room ;" and after all, and worst of all, at night a soulless *rechauffe* of third-rate London frivolity. This is the life-death in which thousands spend the golden weeks of summer, and in which you confess with a sigh you are going to spend them." Why should there be this tiresome monotony ? Why should we condemn ourselves to the most wearisome and profitless of all labour, that of working to kill time, toiling to do nothing ? The meanest of our little seaside villages has its joys and pleasures in store for us. If we will only seek them, the most barren rock, the most desolate shore, present some object of beauty, some living wonder. "Why not then try to discover a few of the Wonders of the Shore ? For wonders there are around you at every step, stranger than ever opium-eater dreamed, and yet to be seen at no greater expense than a very little time and trouble." When we admire the fragments of coral, or the beautiful tiger cowrie shells that decorate our mantle pieces, we little imagine the fragment was formerly a portion of a mighty city with its myriads and thousands of myriads of active industrious inhabitants, and the shell the construction of a poor snail-like creature. "But where now are its gay and active inhabitants ?" We observe it is covered with minute perforations, not for the purposes of decoration or beauty. Every one of these little holes, or cells as they are called, was the habitation of an industrious polype. "During its whole life it was building up its beautiful abode, and without any painful efforts on the part of the inmate, which was all the while enjoying itself amidst the eastern waves, spreading out its numerous tentacula in search of food in the waters ; or, if threatened with being made the prey of some rapacious neighbour, ready on the slightest warning to retreat into its coral cave, where it was safe amidst the multitude of rocks. When in its native position in the deep, the numerous inhabitants, like a happy assemblage of living flowers, are not inferior in beauty to the flowers which adorn our gardens. These are the architects and builders of the thousands of coral reefs and islands of the Pacific Ocean. "Every one," says Johnston, "has read of the coral islands of the tropical seas. How they grow from the fathomless profound, and how they rise to-day by the operation of puny insects, which, in countless numbers and in untold generations, effectuate changes on our globe superior perhaps to what all other animals united do, and to which the greatest achievements of intellectual man sink into insignificance." Still stronger is the language of Dr. M'Culloch in his "History of the Western Islands":—

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* Johnston's Brit. Zoo, 433.

"These plants," he says, "are made of stone, and they build dwellings. Dwellings! They construct islands and continents for the habitation of man. The labours of a worm which man can hardly see, form mountains like the Appenines, and regions to which Britain is as nothing. The invisible, insensible toil of an ephemeral point, conspiring with others in one great design, working unseen, unheard, but for ever guided by one great volition—by that one volition which cannot err—converts the liquid water into the solid rock, the deep ocean into dry land, and extends the dominion of man—who sees it not and knows it not—over regions which even his ships have scarcely traversed." And do not our own shores produce us evidence equally as interesting? Need we traverse boundless oceans and distant lands to witness the power and the skill of the Omnipotent? Have we not within the bounds of our sea-girt isles sufficient, and more than sufficient, to gratify to repletion the appetite of the curious and inquisitive in the wonderful and romantic? Our shores abound in life, our rocks are decorated with lovely living forms that are only equalled in their perfection and beauty by many kindred tribes of the tropical ocean.

True! excellent and eloquent Charles Kingsley. "Happy, truly, is the naturalist. He has no time for melancholy dreams. The earth becomes to him transparent; everywhere he sees significancies, harmonies, laws, chains of cause and effect endlessly interlinked, which draw him out of the narrow sphere of self-interest and self-pleasing into a pure and wholesome region of solemn joy and wonder." One who knew and enjoyed the reality has left us, so beautifully expressed, his testimony of its joys and pleasures, and few have laboured more earnestly in the cause of science than the late Dr. W. H. Harvey. He says, "There is much to be enjoyed on the sea-shore, when the mind is once opened to the pleasures afforded by the study of Natural History, that no other stimulus is wanted to keep the interest of the visitor constantly awake. Instead of finding his time hanging heavy, he will often wonder how rapidly the long summer day has flown by while he has been occupied with some investigation, in the midst of which darkness overtakes him." When visiting the sea to seek relaxation from business, it is astonishing with what zest a person will enter on the pursuit of Natural History, and how invigorating and refreshing he will find it. After a short time, the mind of a habitually busy man finds no relief in complete idleness. He must occupy himself in some manner. He is removed from his ordinary business—perhaps forbidden by a physician from receiving letters that require thought; his mind too active to rest unemployed, and there is nothing in the neighbourhood to rouse him. If on the sea-shore, and happily possessing a turn for Natural History, he is at once supplied with occupation of the most healthful character. His pursuits lead him to take exercise of body, and, without fatiguing the mind, give it that pleasurable excitement which rapidly restores its tone when suffering from having been overwrought. It matters little to which of the natural history sciences he devotes his attention, or whether each in turn engages it. Probably a valetudinarian will feel most relief in variety. He can indulge a taste for geology, either in investigating the sections of strata which the headlands of the coast often admirably exhibit, or in watching the thousand evidences of forces in operation, which are gradually changing the level of our present seas and which explain to us the greater operations of a former era, or show us how, in slowly accumulating periods, changes as great are in preparation even now. If a botanist, when land plants cease to attract his attention, the sea has vegetable treasures in great variety and of inconceivable beauty. The number of British sea-weeds, of the larger class, is not far from four hundred, and if we add purely microscopic species, we shall have upwards of five hundred kinds.

In collecting and preparing specimens of these beautiful objects, and tracing out the affinities which link one kind with another, and bring the whole into a well-ordered family, many happy hours may be filled up. Nor is this selfish pleasure. The true naturalist is always ready to share his pleasures with others, and only half enjoys what he cannot share. The value he attaches to the acquisition of a new plant is quite a different thing from that by which a mere collector estimates his treasure. A collector seeks for unique specimens and will even destroy duplicates, that he may enjoy the silly boast of having the only specimen in existence. A naturalist ever wishes for a series that he may trace the connection between one form and another, and thus use the limit of variation in different species and genera. He works with a constant remembrance of the unity of nature. The more he discovers traces of affinity between different groups, the more the unity of design manifests itself, and the more his conceptions of a personality in the scheme of nature are strengthened and become fixed. From faint and weak beginnings they gradually expand and acquire the solidity of truth. Thus, step by step, and as it were, "from glory to glory," the mind of the true naturalist is led on to the discovery of laws, and to a just appreciation of the system of nature.

"Pleasures of this kind do not belong to any one department of natural history in particular. Zoology in its far greater copiousness and variety, offers an immeasurably wider field. The sea teems with animal life. The various classes of marine animals, and the innumerable species comprised in the whole, are full of interest. Few, even of the most careless, can visit the shore without being struck with their beauty. The gathering of shells is a favourite amusement, but few know anything of the curious animals which have dwelt in them. The dead husks of Zoophytes attract us by their gracefulness and by the truth with which they simulate a vegetable form, but of the animals whose habitations they are, most persons are ignorant of the very existence, believing that the horny skeleton is a veritable sea-weed. The very jelly-fish as it swims in the wave, expanding and contracting its umbrella, and thus propelling itself through the water, has its beauty, but few are aware of the singularity of its history; how its eggs are of the nature of seeds which, sown on their rocky bed, sprout and grow, throwing out buds and suckers, each of which forms an animal stem quite unlike the parent jelly-fish, till at a certain time young jelly-fish begin to be formed and to be thrown off by the several branches, just as flowers are formed and expand on the several branches that originate from a vegetable seed. And if the abject jelly-fish, whose body consists of little more than organized water, have a history so wonderful, shall we not expect to find in tracing the history of other tribes of animals matters of equal interest? The structures, as we ascend in the scale, gradually become more complex; and if those strange metamorphosis which arrest our attention in the lowest tribes give place to more accustomed phenomena, we are amply compensated by the progressive development of the wonder faculty of instinct. In observing the various structure of the analogous organs of different animals, and noticing how, according to the necessities of their life, they are provided with proper instruments, innumerable proofs of the care of Providence over His creatures are offered to our contemplation. These cannot fail to interest us, if from no other reason, because they forcibly remind us of our own dependence upon the same bountiful Hand; and they soothe the most desponding with the thought, that if creatures so humble in the scale of creation are cared for, and their wants supplied in a world that seems as nothing in the universe, must in the sight of its Author be of that inestimable worth attributed to it by revelation. If the truths of astronomy witness to the majesty of God, those of natural history witness no less to the proper dignity of man; and, while the first teach us to humble ourselves before Him 'who inhabiteth eternity,' the second show us that true humility consists, not in supposing ourselves to be beneath the care or unworthy the notice of the High and Lofty One, but in claiming the privileges of that position in His creation which He has assigned to us, and fulfilling its duties, because they are His requiring." *

* Harvey's Seaside Book.

CHAPTER II.

"Oh what an endlesse worke have I in hand,
To count the sea's abundant progeny!
Whose fruitfull seede farre passeth those in land,
And also those which wonne in th' azure sky:
For much more eath to tell the starres on hy.
Albe they endlesse seeme in estimation,
Than to recount the sea's posterity;
So fertile be the flouds in generation,
So huge their members, so numberlesse their nation."
SPENCER.

THE OCEAN AND OCEAN GARDENS.

I HAVE somewhere read, that a *Wander-wit* of Wiltshire rambling to Rome to gaze at antiquities, and there screwing himself into the company of antiquaries, who entreated him to illustrate unto them that famous monument in his country, called Stonehenge. His answer was, he had never seen or heard of it; whereupon they kicked him out of doors, and bade him go home and visit Stonehenge.

I am sadly apprehensive we could scarcely put a more perplexing question to four-fifths of those who are compelled, either because it has become customary or for the mere love of change, to seek a few days or weeks relaxation, than to enquire, where are you going to spend your summer holidays? It's a perfect poser. After a long and deep meditation, at length there comes forth, "*I really do not know*, I am bored to death with the thoughts of it. I've done Ramsgate, Margate, Brighton, Scarborough, the Isle of Man, and those other places, and all that sort of thing; the lakes do very well for *certain occasions*, but there really is nothing in them; London is all very well for a night or so, but a fellow soon tires of theatres, sensation dramas, and the Crystal Palace; and, like Sir Charles Coldstream, after a few seasons, they are fairly 'used up.'" And, as far as the limited resources of the majority are concerned, there is nothing further to be done in happy, merry, joyful England than to jump into a railway carriage, and trust to chance to which of the numerous fashionable sea-side towns it is destined to convey us. I am quite willing to admit, that the lions of our most fashionable and most frequented sea-side watering places may be killed in a few hours; and that, when you have done the piers, promenades, gardens, and views from the cliffs and headlands, you have only—that is, if you do not possess the happiest and the most delightful gift that can be bestowed on man, *the art of seeing*,—to labour and toil to kill time. The late Albert Smith, in one of his novels, has thus graphically described the effects resulting from the yearning after, what may be termed, the exciting grandeur of nature. "A man sees Niagara for the first time, and shouts with rapture, or is speechless with admiration. The next day he thinks it simply a very fine fall. The next week, it does not appear to tumble half so grandly as it did; and he wishes the water would come down in another fashion; unless, like a firework it alters its effects every minute he wearies of it. And yet it is as grand as ever—the same volume is pouring forth, the same iris of brilliant light encompasses it; it sparkles and flashes as of old. But he measures the sensation only by the first effect it produced, and unless it can in itself exceed this, by some new and utter convulsion of its nature, it is no more worth regarding." So many scenes of equal grandeur and sublimity pall upon our senses. We may travel over mountain and valley, survey the grand bold coasts of our native isles, traverse the wider expanse of its ocean seas, and still feel that sameness, that monotonous sameness, that renders us dull and apathetic. Is whirling in excursion trains, at express speed, over foreign lands, the remedy? Certainly not; "and there is yet a consideration why some of us should be content to devote our summer holidays to rambles through the many beautiful localities of our native land. It is because if they are not so content, they must stay at home. It is not given to all to have long purses, so as to enable them to pass a vacation in Norway or Switzerland, Algeria, Arabia, or the Holy Land; neither would it, if we would have the company of those we love, be always desirable or agreeable to do so." So then, kind reader, I politely invite you to accompany me upon a few of my summer wanderings, the first of which shall be on the shores of the delightful silvery Menai, and when we have explored and tired of that one locality, we will hoist sail and away to where the wind and tide listeth, and it will be hard if we cannot find something worth seeing, aye, and worth noting too, as we wend our way to the most frequented haunts of our thousands of annual summer tourists. It has always been to me a source of infinite pleasure, to be accompanied in these real or imaginary rambles, by some young aspiring student of nature, to draw some closet philosopher out of his snug retreat, to induce them to leave the beaten track of travel, and wander with me through untrod by-paths, to follow the footprints of the great Creator; to convince these thousands of summer tourists, sea-side loungers, whose time hangs heavy on their hands, that they can easily dispel the monotony of their visit; that a wonderful volume of instructive and entertaining knowledge, beautifully written and illustrated by the divine hands of Him who has called all things into existence, is placed before them, and "for whose pleasure they are and were created." Now do not imagine I am about to inflict on you either a learned, profound, or elaborate treatise on marine animal life; nothing is further from my purpose or intentions. Science, in the true meaning of the term, will have little to do with the following pages. My object is merely to place before you a faithful and detailed record of the summer cruises of our Nelly; every, or nearly every day's occupation, just as it occurred, divested of all technicalities, or even scientific terms, as far as is consistent with the subject; shore and scenery huntings; rock and tide pool explorations; cavern searchings; deep sea dredgings, inquiring into the habits, characters, and sketching the portraits, after able masters, of the types of the various creatures, as they come into our possession. "Few, very few," says Mr. P. H. Gosse, in the preface to his beautiful and admirable book,—'A Naturalist's Rambles on the Devonshire Coast,' "are at all aware of the many strange, beautiful, or wondrous objects that are to be found by searching on those shores that every season are crowded by idle pleasure-seekers. Most curious and interesting animals are dwelling within a few yards of your feet, whose lovely forms and hues, exquisitely contrived structures and amusing instincts, could not fail to attract and charm your attention if you are once cognizant of them;" and again, "I venture to ask your companionship, courteous reader, in my wanderings over field and down in the fresh dewy morning. I too, ask you to listen with me to the carol of the lark and the hum of wild bee. I ask you to stand also with me at the edge of the precipice, and mark the glories of the setting sun; to watch with me the mantling tide as it rolls inward, and wars among the hollow caves. I ask you to share with me the delightful emotions, which the contemplation of unbounded beauty and beneficence ever calls up in the cultivated mind."

I, too, have not scrupled to sketch pen pictures, and reproduce replicas of the works of this or that and other great masters, of the lovely and romantic scenery with which the coasts of the British Isles abound, "and to press into my service personal narrative, local anecdote, and traditionary legend; and in short any and every thing that, having conveyed pleasure and interest to myself, I thought might entertain and please my reader. It is not the least of the advantages of the study of natural history, that it strengthens in us "the habit of wishing to discover the good and beautiful in all that meet and surround us." Truly, too, I may say, "If it should be objected, that to treat of the facts which science reveals to us, in any other manner than that technical measured style which aims not at conveying any pleasurable emotions, beyond the mere acquisition of knowledge, and is therefore satisfied with being coldly correct, is to degrade science below its proper dignity." "*I would modestly reply, that I think otherwise.*" That the increase of knowledge is in itself a pleasure to a healthy mind is surely true, but is there not in our hearts, a chord that thrills in response to the beautiful, the joyous, the perfect in Nature? Wordsworth has said that man and nature are essentially adapted to each other, and that the mind of man is naturally the mirror of the fairest and most interesting properties of nature. The same mighty mover of the human heart tells us, that "Poetry is the impassioned expression which is the countenance of all science." And all that is required to make the remotest discoveries of the man of science proper objects of the poet's art is familiarity with them, so that "the relations under which they palpably are contemplated by the student, be manifestly and palpably material to us enjoying and suffering beings."

"Such studies," says the author of the 'Poetry of Science,' "lift the mind into the truly sublime of nature. The poet's dream is the dim reflection of a distant star; the philosopher's revelation is a strong telescopic examination of its features. One is the mere echo of the remote whisper of nature's voice in the dim twilight, the other is the swelling music of the harp of Memnon, awakened by the sun of truth newly risen from the night of ignorance."

Previous to stepping on board the packet that will convey us to our starting point, we will take a peep into the aquarium department of Brown's noble Museum, Liverpool, and see a few of the living creatures which will form the principal object of our search in their state of semi-domestication. It has been observed by a very high authority, Mr. W. Alford Lloyd, that aquarium keeping is by no means an easy task, but a constant battling with difficulties, often ending in disappointment and disgust. In this well arranged, but only limited exhibition, under the able management of the talented curator, Mr. Moore, everything is perfection, every creature placed in the most advantageous position, and all in full health and vigour, as though dwelling in their native home. I will not stay to describe the inhabitants of these beautifully constructed tanks, as we shall have abundant opportunities of seeing them in their natural haunts; and also in three tanks, that I believe to have been ever in full working order, since the principle of the chemical action which governs them was first made public, a period now fast approaching twenty years. I know not that we could have a more perfect test of its success on a very small and primitive scale, than these simple vessels exhibited. Mr. P. H. Gosse states, that "Perhaps the most effective aid to the investigation of natural history, which the present age has produced, is the invention of the aquarium, and particularly its application to marine forms of life. Depending on that grand principle of organic chemistry of world-wide prevalence, that the emanations from animals and vegetables are respectively essential to the continued life of each other, it was discovered that the relative proportions of number and bulk, in which organic beings of the two kinds could healthfully live together was easily determined; and since the fact that the creatures were inhabitants of waters, whether fresh or salt, presented no exception to the universality of the law, they had but to be placed together in a suitable ratio, enclosed in a vessel containing water, and an aquarium was established.

"Improvements in the form of the vessel, in the mode of exposing the contents to observation in the impact rays of light, in the arrangement of the interior, and other points of value have indeed been progressively made, whereby the practicable availability of the invention for the purposes of experimental natural history has been augmented, but some of us have found little difficulty, even from the first, in maintaining the collections of sea-water unchanged from year's end to year's end. We collect the creatures indeed abroad, and then gather up some broad facts of interest concerning their modes of life, but it is at home, in the quiet of the study, with conveniences and aids to examination, experiment, and record at command, that they must be studied. The aquarium becomes, in fact, an apparatus, whereby we bring a portion of the sea with its rocks, and weeds, and creatures, to the side of our study table and maintain it there." But long antecedent to this period, the late Sir J. Graham Dalyell, maintained and preserved marine creatures for a long period, some few for many years, to whose history I shall again refer.

The London Zoological Society, the first who were in the field, have made some advances towards perfection, but are still lamentably behind the times, or the advancements that have been made in the public institutions of Paris and Hamburgh, both constructed under the management and superintendence of an English naturalist, Mr. W. Alford Lloyd, and both illustrious evidences, when ample means are employed, of what can be done, either in a scientific or a pecuniary point of view; this, desirable as the movement really is, is far from all that can be, or ought to be, desired. A nation so proud of all that concerns her seas, should not be represented in so important a branch of science, by either an influential *private* society of learned and scientific savants, or a great public company. With the first it is in some sense a speculation, the expense independent of gratuitous foreign aid and contributions of rare living specimens, is enormous. Yet it must be made to pay, hence the system of stars,—the hippopotamus and sea anemone, the subjects of Mr. Lewis' sarcasm; with the second it is entirely speculation, no doubt a good one, but still every means must be resorted to for the sake of a dividend and a balance, represented by those important letters, £. s. d.

Another, and a most important announcement has been made, which is deeply interesting to the scientific world. The Crystal Palace Company have formed, within themselves, a company with ample capital, £10,000, for the construction and maintenance of marine and fresh water aquariums, upon a scale of magnificence hitherto not contemplated, and through the kindness of Mr. Groves, the secretary, I am informed they will be under the same able superintendence that has rendered the Hamburgh aquariums so eminently successful.

If successful and carried out in its integrity, of which I have the greatest expectations, an opportunity of close and valuable familiarity with sea productions will be open to multitudes, who have never seen the broad expanse of ocean, nor searched its prolific shores; and facilities for extending the bounds of zoological science every where enjoyed, which were, until latterly, restricted to a very few naturalists, whose residences were situated on certain favourable spots upon the coast.

Yet both modes of investigation are necessary. "He who has never seen marine animals, except in the confinement of an aquarium, cannot but be conscious of many chasms in his knowledge, which are filled up by him who is in the habit of collecting his own specimens, in their own proper haunts; and who, by finding them *in fèra naturâ*, can, when he studies them at leisure, either in his own private or the public tanks, make such allowances as are necessary for the variations in habit, which may be dependant on the differences between their present artificial, and their original natural conditions of existence."*

The history of the aquarium is very remarkable; almost every writer on the productions of the ocean claims the honour of its invention for some particular individual; the dates are almost as various as the names. The translator of Figuier's "Ocean World," places it to the credit of M. C. des Moulins, of Bordeaux, who, in 1830, found that when a globe filled with fresh water, and with molluscs, crustaceous, or fishes, he observed after a few days that the water loses its transparency and purity, and becomes slightly corrupt. It necessarily follows that the water must be changed from time to time. Changing the waters, however, causes much suffering and even death to the animal. Besides the new water does not always present the same composition, the same æration, or the same temperature with that which is replaced. To obviate this defect, and taking a leaf out of nature's book, M. Moulins proposed to put into the vase a certain number of aquatic plants, floating or submerged—duckweed for example—which would act upon the water in a direction inverse to that of the animals inhabiting it. It is known that vegetables assimilate carbon, while decomposing the carbonic acid produced by the respiration of animals, thus disengaging the oxygen indispensable to animal life. In this simple manner was the necessary change of water obviated, and the immense amount of labour, of daily, or even more frequently, changing the water, as pursued by the late Sir J. G. Dalyell, entirely dispensed with, and rendered unnecessary. The same happy idea was adopted by Mr. P. H. Gosse, and other eminent naturalists, with perfect success to the marine aquarium. But still it had only a fitful existence, and scarcely made any progression until 1861, when was inaugurated, in the Zoological Gardens of Paris, in the Bois de Boulogne, the then largest series of aquariums in the world, since far surpassed by those at Hamburgh.

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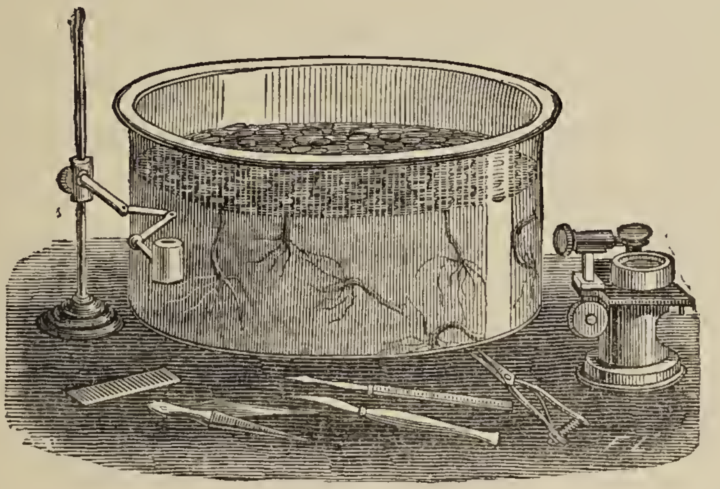
* Gosse's "Year at the Sea-shore."

The building is solidly constructed of stone, forty yards long and ten broad, showing a range of fourteen reservoirs of Angers slate, facing the north. These reservoirs are nearly cubic, and have a front of strong glass, through which the interior can be examined. They are lighted from above, but the light is weak, greenish, uniform, and consequently mysterious and gloomy, giving a pretty exact imitation of the submarine light some fathoms down. Each reservoir contains about two hundred gallons of water. It is furnished with rocks, disposed a little in the form of an amphitheatre, and in a picturesque manner upon these rocks, spread and grow different species of aquatic plants, and upon which dwell the peculiar animals. The floor is shingled with pebbles, gravel, and sand, which also affords sufficient cover for many animals. Ten of these reservoirs are appropriated to marine objects. The quantity of water used is about 4,000 gallons, it is never changed, but is continually flowing. The means by which the flow is secured, are as follows :—"Advantage is taken of the current of water which is brought by the pipe which waters the Bois de Boulogne. This is under great pressure, and is brought to act upon air confined in an inverted cylinder. This air is admitted into another cylinder below the level of the aquarium, in which is some sea water; this it forces up with great power into each of the reservoirs, which it enters by a little jet. The compressed sea water contains a great deal of air, which it carries with it into the reservoirs. A pipe in the corner of each carries off the overflow into a well-packed carbon filter, from whence it passes into an under-ground reservoir, made of iron and lined with gutta percha. From this the water is returned into the closed cylinder, is submitted again to the pressure of the air, and is again injected into the aquarium. The cylinders being all under ground, keep a uniform temperature of about sixteen degrees Cent., which is nearly the general temperature of the sea. By means of a very simple contrivance in each reservoir, the quantity of water can be diminished, and the ebb and flow of the sea thus imitated. And, at the same time, by considerably lowering the level of the liquid, certain creatures can be periodically exposed to the air. In this circulation and movement of the water its volume is diminished by evaporation, and the inorganic matters remaining in the liquid, at last would become too salt. To remedy this, by means of a special apparatus, a certain quantity of rain water, which comes from the roof of the building, is passed into the great reservoir; an hydrometer indicates the time when this addition of fresh water is necessary. But our spirited neighbours have made a still more important advance; satisfied with their successful culture of fresh water fish at their pisciculture establishment at Huningue; they have constructed ponds for the rearing of salt water fish, at Concarneau. "There are some reservoirs in which fish are preserved, and others still larger for rearing crustacea, which seem to be the most profitable part of the undertaking.

In the aquariums every possible phase of marine life can be seen in full vigour: the voracity of cuttles, the moulting of the crabs, the incubation of the plaice, the nests of the sea-horse, and all the wonders of the world of the sea can be witnessed."*



POLYPES.

A short but pleasant sail has carried us to the base of Telford's æriel bridge, and the straggling but picturesque village which bears its name, Menai Bridge. But before we pass over the fairy structure to the Carnarvonshire side, or pursue the pleasant drive that leads to the delighful sea-side town of Beaumaris, we will, with the kind permission of Mr. Edwards, pay a visit to the three aquariums, before alluded to. On a rock, at the foot of the bridge, a little lower than the abutment, on the Britannia side, projecting out into the silvery stream close to, where the angry waters of the Menai are lashing themselves into foam against the Swilly rocks, is posed a delightful white cottage, with an inviting green lawn, or rather croquet ground in its front; this is the pleasant residence of Menai's naturalist. In the far angle of the green lawn, enclosed in a clump of lovely trees, is a small wooden building. It cannot be a summer house, for there are no external windows; and plain and unostentatious as it really is, it is far too elaborately constructed for a mere tool house. We will enter it. On passing out of the bright sunshine into the interior, we are at first struck with its gloomy appearance; but in a few moments we become accustomed to the rays of light, as they pass through the transparent water of the three tanks that are now before us. The light penetrates into them from a glazed opening in the roof, enclosed and screened by a partition, to the level of the front of the tanks; these are placed side by side, each about two feet four inches wide, four feet from back to front, and twenty inches deep. It will at once be seen, that the extent of surface has been proportioned to the depth of water. These tanks are not mere infants, but have been in existence many years, and have never suffered from the new-fangled notions and changes of fashion, or been submitted to the infliction of patent inventions, but remain to this hour in their primitive state, and have formed models for those that embellish the gardens of Regent's Park and the Bois de Boulogne. The sides, end, and floor, are Welsh slate; the front, polished plate glass. Extending about twelve or fourteen inches from the front, is a layer of clean bright shingle, about two inches deep; from this springs natural rock, until it crops out at the surface of the water, near the back end of the reservoir; to the sides are also secured ledges of rock. Every creek, fissure, cave, arch, and pointed fragment, remain so as to represent a miniature *fac simile* of a portion of the sea shore. Wherever the sun's rays have penetrated to this rock-work, are growing, in great luxuriance, the delicate green ulva and minute algæ; from the various fissures spring small tufts of the rich dark olive and green sea-weeds, intermixed with a few of the red tribes, as the rich coloured dock-leaved delesseria. *(Delesseria sanguinea.)* These are the generators of the life-sustaining element, oxygen.

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* Tandon, "Le Monde de la Mer."

But where are the living creatures that should attract our attention? Presently we perceive on the rock points and ledges three species, very closely allied. The scarlet fringed *Actinia miniata*, with its elegant circlet of orange-red tentacles, forming a margin to others beautifully curled and variegated; next, the golden, star-like, orange-disk'd, *A. venusta,* bordered with its frill of pure white tentacles; then the snowy *A. nivea,* of dazzling whiteness, and column of lovely umber, or pale quiet drab; at the foot of these, crowding themselves together, so as hardly to permit room for their puckered disks, are small colonies of various daisies, *A. bellis*; while on the opposite angle, stretching out its long column, and displaying its crown of filaments and pellucid tentacles, is the snake-locked *A. viduata.* In the centre, on the shingle, and in every available space in the rock, are an almost endless variety of the cave dweller, *A. troglodytes,*—no longer shy and timid, retiring into their holes with rapid movement, but displaying their aurora disks to our wondering and admiring gaze. Perched on a pinnacle of rock, we see a full-grown opelet, *A. cereus,* of the rich olive brown colour, its long, pendant tentacles waving about in all directions, surrounded by others, as far as the eye can reach, of slate, pale drab, fawn, silvery grey, and beautiful shades of green, glossy as silk, the tentacles tipped and banded with rosy pink, or prismatic colours. On the margin of the tank, within two inches of the surface, the smooth-skinned beadlet, (*A. mesembryanthemum*) has taken its position, and forms an elegant border to this lovely parterre. These are all self colours, but of transcendent hues. They are of various shades, of dark purple, golden amber, and pale yellow, deep red, crimson, bright scarlet, rose pink, velvety olive browns, buffs, fawns, slates, grass, emerald, and sea-green, exhibiting, when fully expanded, a necklet of azure beads, rich as the torquoise gem, forming a rich contrast to their delicate tentacles and prettily shaded disks. While we have been admiring these, that rare and beautiful fish, the butterfly blenny, *Blennius ocellaris,* has sprung from some snug retreat and approached the glass, to receive from the kind hands of its master the dainty prepared for him. See how carefully he returns and avoids those long poisonous arms of the opelet. Full well he knows one moment's embrace is instantaneous death; but he has retired from our view, and there we will leave him and examine the next tank. Many of the denizens of the former tank we find in this also. But, on the centre rock stands erect, with noble boldness, decked in a bridal robe of the purest pellucid white, with a crown of tentacles, so short, so numerous, so dense, so elegantly folded, and lobed, gracefully drooping as to form a miniature representation of ostrich plumes; and at her base are a colony of many generations—truly does she deserve the appropriate name of plumose, *Actinoloba dianthus.* Surrounding on all sides are others of the richest salmon and deep orange colour of the same species. Their colours are as various as are the different shades of white, pinks, and olives: all are self colours but of surpassing beauty. It is by far the noblest and most elegant of our native sea anemones. But this is not the only beauty we find here. Peeping from every spot is a lovely native of the Isle of Man and South Devon—the gem, *Bunodes gemmacia,* its vivid and various colours adding lustre to its companions. No sooner does a small shoal of grey mullet change its position than we perceive, protruding from between the cleft of the rock-work, a group of dark, leathery like, dirty tubes, having much the appearance of a bundle of old saturated twigs. In a few moments is seen protruding from a few of these unsightly tubes the points of a brilliant coloured pencil: presently it unfolds, and then we perceive a crown of exquisite loveliness, and we recognize the hook-plumed sabella, *Sabella bombyx.* Now the rows of fine filaments have taken a funnel shape; in an instant have again changed and are gracefully incurved, and its rich, variegated colours of pale, red brown, mottled irregularly with deep, brownish purple and white, bound at the base by a narrow frilled membrane of pure white, are seen for a few seconds to great advantage; ere again we can obtain a glance, with the slightest movement, or even a passing shadow, it vanishes from our sight and we turn to the next tank. In this we find but one species, but it is a gorgeous one—in colour, the very variety of variations, no two alike, rivalling, not only in form and size, but in the arrangement of its magnificent colours, its floral namesake the dahlia, and properly named by Mr. Gosse the dahlia wartlet, *A. crassicornis.* No pen picture can convey a true representation of the living animal; you find one, the column of which is of the richest orange, the disk bright scarlet or crimson, the tentacles of pellucid or opaque white; in others, the column will be streaked with the colours of the ripest nectarine or the rich bloom of the choicest apple; the tentacles painted and banded with rings of deep crimson or the highest flush of rose, with a broad lilac line or one of rich brown. At the base of the conical tentacles are drawn lines of every imaginable shade of colour, and diverging and radiating from them are others of the richest hues, and exquisite pencillings of gold, red, white, and black. In size they vary from that of a shilling to one of at least eight inches in diameter. They are found in great abundance on all parts of our coast, and inhabit every zone, from the highest tide marks to fifty fathoms water. We seldom see them in our aquariums; they are remarkably delicate and rarely survive more than a few weeks or months; they require to be constantly supplied with food or they will exhibit an unpleasant propensity of protruding the lobes of the stomach, distending it like two large bladders and nearly turning themselves inside out. Although these beautiful and well managed tanks are only stored, with one exception, with the few species of Sea Anemones indigenous to the Menai Strait, which will only embrace about nine distinct species out of the seventy and upwards that are known to inhabit our coasts, and are a very faint representation of the wonderful abundance and extent of our *fauna*, they are a happy foretaste of anticipated pleasures and of the glorious creatures we hope to find in our wanderings.

The inhabitants of the water are much more numerous than those of the earth. "Upon a surface," says Humboldt, "less varied than we find on continents, the sea contains in its bosom an exuberance of life of which no other portion of the globe could give us any idea. It expands in the north as in the south, in the east as in the west. The seas, above all, abound with it. In the bosom of the deep, creatures corresponding and harmonizing with each other sport and play. Among these especially the naturalist finds instruction and the philosopher subjects for meditation. The changes they undergo only impress upon our minds, more and more, a sentiment of thankfulness to the author of the universe."

"When the tide retires from the shore, the sea leaves upon the coast some few of the numberless beings which it has in its bosom. In the first moments of its retreat the naturalist may collect a crowd of substances, vegetable and animal, with their various characteristic colours and properties." As we follow the retreating tide, at almost every step we find a gradual but positive change in both the vegetable and animal production, each species seem to be confined within certain and ascertained limits, and the character of the vegetation and class of animals found within these limits truly indicate the exact position of the series of zones or regions into which our shores are divided.

"The highest of these belts is the space between tide marks, an interval of very great importance in the marine fauna of our islands, and inhabited by numerous peculiar species of plants as well as animals. It is termed the LITTORAL ZONE. Its features vary with the geological, or rather mineralogical, character of the coast, and its population, both as to kinds and numbers, varies considerably." The late Professor Forbes, in a very interesting paper read before the Royal Institution in 1851, fully describes the principal features that characterize each zone. So far as regards the presence of mollusca, whatever be the extent of rise and fall of the tide, this zone, wherever the ground is hard or rocky—thus affording security for the growth of marine plants and animals—presents similar features, and is inhabited by numerous gasteropodous molluscs; where muddy or sandy by burrowing bivalves, or, in such localities is not unfrequently devoid of testacea and zoophytes. This region again is subdivided into a series of corresponding sub-regions, through all of which the common limpet, *Patella vulgata*, ranges, giving a character to the entire belt.

"Each of these sub-regions has its own characteristic animals and plants. Thus, the highest is constantly characterized by the presence of the periwinkle, *Littorina rudis*, (and on our western shore *Littorina neritoides*) along with the sea-weed *Fucus canala-*

culatus, and the beadlet or smooth-skinned Actinia, *A. mesembryanthemum.* The second sub-region is marked by the sea-weed *Lichina*, and the common mussel *Mytlus edulis*, together with an increased number of Actinia, as the dahlia, *A. crassicornis*; the opelet, *Anthea cereus;* the gem, *A. gemmacia*, and many varieties of the beadlet. In common with the third sub-region, it almost always presents rocks thickly incrusted with barnacles, so that, where the shores are steep, a broad, white band entirely composed of these shell-fish may be seen, when the tide is out, marking the middle space so conspicuously as to be visible from a great distance. In the third sub-region the commonest form of wrack or kelp, *Fucus articulatus*, prevails, and the larger periwinkle, *Littorina littorea*, with the *Purpura capillus*, are dominant and abundant. Mingling with the shingle, where there is a wide-spread beach or shilly, in the crevasses of the rocks, and pools, are found the daisy, *A. bellis*, the scarlet fringed *A. miniata*, the orange disked *A. venusta*, the snowy *A. nivea*, and, in almost protean variety, where there is a stratum of shell sand the cave-dwellers, *A. troglodytes.* This beautiful creature is very difficult to find. I have known an experienced naturalist wander over the rocks for days and not secure a single specimen, but when the secret of their hiding-place had been pointed out found himself surrounded by hundreds. If we carefully examine where the water is gently trickling over the shingle, or bring our face to the surface of the shallow pools, we shall observe their lovely disks peeping above the surface of the sand, but the movement of a stone or a fragment of sea-weed and they instantly contract their tentacles, covering their suckers with fragments of shell, sand and gravel, vanish from our sight and sink into their caves or holes. The gorgeous dahlia, *A. crassicornis*, which is distributed throughout the entire zone, has also a similar happy knack of concealing itself, and to the inexperienced rather difficult to detect. In the fourth or lowest sub-region the *Fucus* just mentioned gives way for another species, the *Fucus serratus;* and in like manner the shells are replaced by a fresh *Littorina* (*littoralis*) peculiar Trochiae, with the addition of many distinct species and varieties of the Actinia. Once below low water mark the periwinkles become rare or disappear, and the Fuci are replaced by the gigantic sea-weeds, known popularly as tangle, a species of *Laminaria Alaria,* &c., among which live myriads of peculiar forms of animals and lesser plants. The genus *Lacuna* among shell-fish, and the noblest of our sea anemones, the *A. dianthus,* is especially characteristic of this zone. The most beautiful variety of the beadlet, the strawberry, is generally found within its limits. In sandy places the *Zostera,* or grass wrack, replaces the *Laminaria.*

The Laminarian Zone extends to a depth of about fifteen fathoms, but in its lowest part the greater sea-weeds are comparatively few, and usually the prevailing plant is the curious, coral-like plant named *Nullipore.*

From fifteen to fifty or more fathoms, we find a zone prolific in peculiar forms of animal life, but from which conspicuous vegetables seem entirely banished. The majority of its inhabitants are predacious. Many of our larger fishes belong to this region, to which, on account of the plant-like Zoophytes abounding in it, the name of the Coralline Zone has been applied. The majority of the rarer shell-fish and sea anemones, as the *A. adamsia, A. parasitica, B. tudiæ, B. eques, T. digitata,* have been procured from this region.

Below fifty fathoms, Forbes observes, "is the Region of Deep Sea Corals, so styled because hard and strong; true corals of considerable dimensions are found in its depths. In the British seas it is to be looked for around the Zetlands and Hebrides, where many of our most curious animal forms of Zoophytes and Echinoderms have been drawn up from the abysses of the ocean. Into this region we find that not a few species extend their range from the higher zones."

So, also, local forms and occasional stragglers from these lower regions travel upwards, and are found mingled here and there with those whose habitat is the higher regions. Before the days of Ellis, Montague, Leach, Forbes, and Jeffreys, the geographical and bathmetrical distribution of molluscs and zoophytes was little known, and those who are desirous of forming a perfect collection must visit many parts of our coasts to obtain anything like an approximation of the number of species. No doubt molluscs and zoophytes are common to all parts of the British seas, where the conditions of the sea bottom and littoral rocks are similar. The marine animals found off the Channel Isles present certain differences, not numerous, but not the less important from that of the south-western shores of England, which, in its turn, differs from the Irish sea, and it again from the Hebrides. This may be termed the neutral ground, the central portion of an area where immigrants from both north and south meet. The Isle of Man and Anglesey are peculiarly favourable for an assemblage of these immigrants; independent of the aboriginal inhabitants, we often find others that have travelled from the extreme north—almost arctic—and occasionally a rare specimen of the southern type. There are also others to be found in peculiar and limited localities, which form distinct groups, as it were, isolated colonists.

The Cornish and Devon seas, and that of the Hebrides and Shetlands, are marked by redundancies of species; that of the Eastern coast of England, on the contrary, by deficiencies. Along the whole of our Western coasts, whether of Great Britain or Ireland, we find an assemblage of creatures which do not strictly belong to that province, but are identical with similar isolated assemblages on the west coast of Scotland.

A vast field for search and study is here presented before us—lovely and exquisite forms, wondrous living creatures, and in close association with molluscs we find hundreds of other forms equally interesting, equally as mysteriously constructed as the mighty army of scavengers that cover the higher zone, clothing the rocks with beauty—consuming the decayed vegetation, purifying the waters and atmosphere, and ever performing unerringly the duties ordained by Him who is All-wise.

Happy truly is the man who believes that God has created all things for Himself and rejoices in His handiwork, and that the material universe is as the wise man says, "A platform whereon his Eternal Spirit sports and makes melody." Of the blessings which the study of nature brings to the patient observer, let none be classed higher than this; that the further he enters into those fairy gardens of life and truth which Spenser saw and described in his great poem, the more he learns the awful and yet more comfortable truth that they do not belong to him, but to one greater and wiser, lovelier than he, and as he stands silent with awe amid the pomp of nature's ever busy rest, hears as of old, "The word of the Lord walking among the trees of the garden in the cool of the day."

LAMINARIA.

CHAPTER III.

"Let us go round,
And let the sail be slack, the course be slow,
That at our leisure, as we coast along,
We may contemplate, and from every scene
Receive its influence."

ROGERS.

THE MENAI.

"THE principal charm of Welsh scenery," Roscoe remarks, "lies in its continued variety, its varied aspects, and novel effects. For this reason, perhaps, few people have visited Wales only once, and no one with the eye of a painter, or one feeling of the genuine traveller, studies its characteristics, without deriving pleasure from that singular change of tone—that succession of colours, lights, and forms, which, investing the grandest no less than the minutest objects, paints mountain, vale, and stream like the flowers, the lichen, and the rock, in a thousand dark or brilliant evanescent hues. It is this distinctive feature, doubtless, which more irresistibly recommends it to English taste, and imagination induces us to seek again and again the ever fresh and delightful scenes which assume in their rapidly passing phases so many features to interest all those who are fond of change."

And if for the present we leave the Snowdon range and wander through the lovely valley of the Menai, we shall not only find nearly all the peculiar features of sand, rock, and beach, that are met with in greater magnificence on nearly all portions of the western shores of England and Ireland, but very many of the living creatures that abound on them also.

But perhaps the most interesting, more especially to the naturalist, portion of the Strait, is that which stretches from the Britannia Rock, on which rests the base of the principal pier of the *Tubular Bridge* to Penmon Point and Puffin Island, on the Anglesey and Great Orme's Head, on the Carnarvonshire side. Except at peculiar times of the tide, the navigation of the Strait between the two bridges is both difficult and dangerous, the velocity of the currents being often nearly nine miles an hour, and so driven by the immense sunken rocks in the centre of the stream into whirlpools and fierce torrents, that it is next to impossible for any boat to contend with them. But at other hours, that is about the time of high and low water, it is as placid as a gentle inland stream. But no matter whatever the difficulty of the navigation of this portion of the Strait may be, the most interesting rocks can be easily reached by delightful walks through pleasant grounds, either along the Carnarvonshire or Anglesey shores, but the first is not only a much shorter but a very much less tiresome one to travel. When we have arrived within a few hundred yards of the Tubular Bridge a pathway leads us down to a flight of steps cut in the solid rock, and we perceive, facing us on the opposite side of the Strait, where it greatly expands, the beautifully situated cottage of Mr. M. Jones, and his fishing weirs crowning the summit of the island of *Gored Goch.* A hail, and in a few minutes a boat, propelled by his two intelligent sons, comes to our assistance, and as we cross this portion of the stream we perceive another rugged rock just rearing its head above the water, and another a few cables length of the hard-named island. The tide is still far too high for the gratification of our naturalising propensities, and while we patiently wait its retirement, let us take a glance at the surrounding scenery. Before us is the Tubular Bridge revealing all its noble proportions, and swarming its sides, suspended in mid-air, are seen a company of painters dwindled to the size of pigmies, forming a strange contrast to this gigantic work of man. The bridge itself has been frequently described, therefore it will be sufficient to say its site has been happily chosen, nature having furnished a rock in the middle of the stream for its chief resting-place. Looking towards the straggling town of Menai, along the Anglesey shore, where there is a wide expanse of waters flowing far inland, and a rich, luxuriant growth of wooded land reaching down to the highest tide mark, are other small islands and a pretty village church in their midst. Beyond these islands an immense rock protrudes far into the stream, and at its extremity gracefully swings that magnificent monument of Telford's genius—the Suspension Bridge. He selected a spot called *Snys-y-moch*, where the bold rocky shores on each side gave opportunities for a lofty roadway, which was carried one hundred feet above high-water mark, so as to allow a full-sized vessel to pass underneath. An intelligent tourist (Mr. John Smith), in his "Guide to Snowdonia," presents us with the following graphic account of this wonderful structure: "Having landed by means of boats on the Anglesey side, we proceeded to the bridge, the visiting of which is a new era in the lives of those who have not before had that pleasure, and is a renewed luxury to those who have seen it again and again. Our party walked over the bridge slowly, because there was something to be admired at every step; the effect of a passing carriage; the vibration caused even by the hand applied to the suspending rods; the depth to the level of the waters; the fine view of the Straits in both directions; the lofty pillar erected in honour of Lord Anglesey; the diminutive appearance of persons on the shore; the excellence and strength of the workmanship; the beauty of the arches over the road through the suspension piers, and the echo in them—all conspired to delight and detain us. Many of our party went down the steep bank to the foot of the bridge, from which point certainly the best view is to be had of the whole structure, inasmuch as by being in contact, as it were, with its proportions on *terra firma*, a better idea can be formed of its real and indeed wonderful dimensions. We actually lingered about the spot careless of time or of aught but the scene we were contemplating. There is so much magnificence, beauty, and elegance, in this grand work of art, that it harmonizes and accords perfectly with the natural scenery around, and though itself an object of admiration, still in connection it heightens the effect of the general view." Nothing can possibly excel the sylvan beauty of the different views from Penmon to the upper of the two bridges; the long expanse of beach and lovely town of Beaumaris, the wide and almost level surface of the Lavan sands, the pretty village of Aber nestling at the foot of the giant Penmaen-Mawr and the Snowdon range, the vast gloomy building *Penrhyn Castle*, seated on an eminence embowered in trees, has, at a distance, a very imposing aspect; but, on a nearer approach, and after entering its walls, the effect is far less agreeable. Then we see the palatial hotel of *Penrhyn Arms*, with its noble sea frontage, enlivening the dull pier and harbour of port Bangor. Next, we pass the projecting point of Garth; its antique ferry and long strip of landing stage, which leads us to the opposite shore beyond the richly-wooded lands of the Bulkleys, to a succession of elegant villas, their green turned lawns losing themselves in the silvery transparent stream. Between the bridges, on the Carnarvon shore, is a wall of perpendicular rock, broken and projecting here and there, rising from the deep water, and divided or split into fissures and crevices, teeming with ocean and littoral life. The tide will now permit a partial exploration of the island *Gored Goch* and its neighbouring rock. Walking slowly round the walls of the weirs and removing the drapery of slimy sea-weed from its face, we find between the interstices of the loosely built flag stones myriads of the smooth-skinned anemone the beadlet, *A. mesembryanthemum*, of the green varieties, intermingled with a few of the dark olive and red browns. There is a peculiarity connected with this colony of beadlets seldom met with elsewhere, not only as regards the position they have taken, but in their vast assemblage and varieties. They are met with in no other part of the Strait. We may search every portion of this little island rock, and the opposite shore, in vain, not one is to be seen but those who have made the artificial wall of the weirs their dwelling place. Removing the fuci we perceive them hanging in clusters from every stone, stretched by the weight of water they contain until nearly tearing away the fleshy tissues of the expanded base, having much the appearance of ripe and unripe greengages. So slightly do they adhere to the thin coating of mud, which covers the stones, that it requires no instrument to remove them; they yield to the slightest force—the adhesive layer of mud separating from the stone; we noted and collected no less than five distinct varieties, many of extremely large size. *Umbrina*, column disk and tentacles a yellowish umber brown, specules azure, basal line deep blue, which is the same in all the following varieties: *Ochracea*, column disk and tentacles orange buff. *Olivacea*, dark olive. *Glauca*, pellucid bluish green tentacles, plate bluish green disk, shaded with yellowish and bluish green. *Parisina*, exquisite leek green, of the most vivid shade, tentacles the same, or occasionally tipped with a yellowish green, beautifully pellucid; the two last varieties are truly lovely animal flowers, and are almost peculiar to this locality, or become very rare elsewhere.

We now prepare for a different kind of warfare, and require the dexterous use of the hammer and cold chisel; passing in the numerous tide pools, small colonies of daisies, and in the angle of the rocks fine dahlias, we descend the slippery steps to a little creek, through which the tide in another hour will rush in a foaming torrent. The floor of this creek is covered with tangles and loose blocks of coarse grained schist and lime stone; turning these over we find their surfaces decked with the closed buttons of the beautiful scarlet fringed and snowy *Sagartia*, exquisitely beautiful creatures. But our guides kindly inform us we shall find much larger and finer specimens on the great central rock in the middle of the stream, and to these we wend our way, and with difficulty find a footing on a mass of sharp-pointed rocks, leprous with myriads of the acorn shell, barnacles, and in the midst of a dense growth of gigantic tangles; soon we scramble through this forest of sea-weeds, which, on removing, reveal lovely rock pools, swarming with the silvery whitebait, or from which the shanney, the goby, or ancient wrass take a momentary peep at us. At length we reach a ridge of rock, from which the tide is just receding, and removing the sea-wrack, find treasures that would delight the most apathetic of shore hunters. The entire surface of this rock, the twisted knotted roots of the tangles, are crowded with the lovely cones of two varieties of the *Miniata* and *Nivea.*

The scarlet fringed, of an unusual large size and brilliant colours, the snowy with the rich deep umber or pale drab columns. Mr. Gosse remarks, "that the finest specimens he had ever seen of the *Miniata* were obtained by Mr. W. Alford Lloyd from the Menai (this rock), and that specimens two inches in diameter were not at all rare." I am happy to be able to verify this fact, and that they are also equally abundant as they are magnificent in size. The *Ornata Brunnea* are the prominent forms, the last-named being also abundant on loose stones and old shell valves, especially that of the cockle and mussell, under and near the wooden stage of Garth Ferry. Both the scarlet fringed and the snowy, which appear to be the only species that inhabit this rock, require much care and dexterity in chipping them from it, although the stone readily yields to a few blows on the chisel. Care must be taken not to strike it too near the animal or fracture it beneath its base, as the least injury to that sensitive part is fatal—those found in the twisted knots of the tangles are easily secured by cutting away the roots, and although frequently only the smaller specimens, and very numerous groups of minute Actinæ, they may be esteemed the most valuable that are secured. On placing them in a vessel of sea water with a floor of loose stones and shell valves, in a few days they will desert the perishing roots and select a much more desirable position, and will soon increase in size and become hardy. One most beautiful variety of the snowy found on this rock is the *Obscurata;* it is very difficult to distinguish from the scarlet fringed when in the contracted or button form, the column is of a rich orange brown hue, sometimes approaching, when young, a deep red or rose brown; but the most prevalent variety, and perhaps the most lovely is the *Immaculata,*—column, light olive drab, slightly varying in intensity, becoming paler towards the lower half, which is often marked with alternate longitudinal bands of white and drab tint, suckers whitish, which form somewhat conspicuous warts.

Disk, opaque white, without markings except when fully expanded, a grey tinge spreads in a circle near the bases of the tentacles, occasionally a very faint tinge of yellow surrounds the mouth.

Tentacles, pure snowy white opaque, except when much disturbed with water, without any markings either on the body or around the foot. *Mouth*, lip, and throat pure white. Large specimens will seldom exceed the diameter of an inch in height.

Allowing our boat to glide slowly with the current below the wall of rock that skirts the Carnarvonshire shore, and peering into the crevices are seen numerous colonies of very young Plumose, *A dianthus*, the scarlet fringed and snowy-white hue; and there the beautiful starlike orange disked *S. venusta;* or crawling over the common sponge, the sea lemon, *Doris tuberculata*, a remarkable nudibranchiate, which shall be more fully noticed in its proper place. The now foaming whirling waters of the tide will not permit us to cross the Strait to the cluster of islands and the widespread mud banks on the Anglesey shore, which do not present, when left by the tide, a very inviting appearance; although on a former examination it was found to be the habitat of the daisy, and the lovely tube-dwelling sabella, which we shall find in equal abundance in more pleasant places. I will not invite you to trudge ankle deep over slimy mud to collect these, or turn the loads of sea-wrack on the group of rocks, near the foot of the Suspension Bridge to gather dahlias, but bring our evening's ramble to a close.

Almost at the first peep of day, say three o'clock a.m., we are quietly dropping down the Strait from the Suspension Bridge to Garth Ferry; before the time we shall have reached that spot it will be nearly low-water, spring tide, and the full length and breadth of the old wooden landing stage exposed to our investigation. Now, I would earnestly recommend any friend, who is desirous to perform this duty, to assume a toilette fitting for the occasion: a dress of good strong blue pilot cloth, "warranted not to spoil," and strong sea-boots, reaching to the hips, is the only suitable garb. The Menai, doubtless, is a beautiful, clear, bright, transparent stream, but with every flow and ebb of the tide it stirs up with unceasing energy, a dirty slimy mass of tenacious mud, which it leaves in various places as a sediment behind it; but over and through this and that, frequently hip deep in water, you must make your way if you are desirous to see what can be seen, and is really worth seeing.

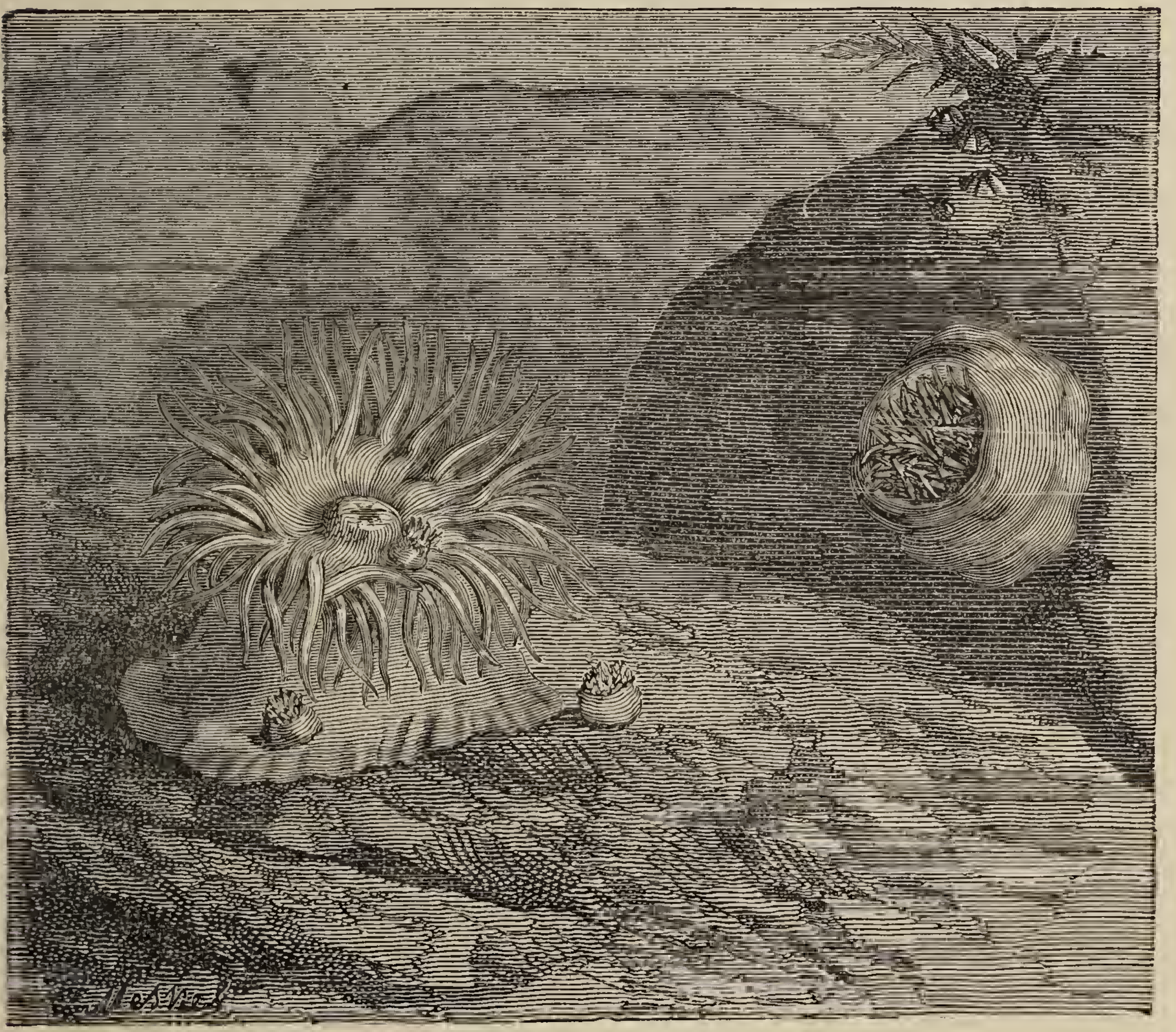
We have arrived at the first portion of our present hunting ground, and step out of our boat on the ridge of the old deserted causeway, only a few paces above the present ferry stage, and I can easily imagine the misery of the hapless voyager, who had to land in ancient days and in stormy weather on this strip of slimy mud and ill-paved roadway—paved it never could have been, but only a few stones sprinkled over it to enable the adhesive slime to hold its own, or as a slight protection against the fierce rolling tide; but even now, in stormy weather at low water, it is occasionally used as the safer landing place. But if the biped animal has almost ceased to traverse it, the gorgeous dahlia has made it its habitat, and we find at almost every step its contracted partially covered cones protruding, in almost endless variety, through the surface. No other implement than a small sharp draining spade, or a garden trowel, is required for their capture; no other receptacle for their temporary safe keeping than a large flat-bottom basket. These are advantages rarely met with, for they are usually found in the angles of the hard firm rocks, or firmly adhering to the sides of some deep rock pool. Long before we have traversed the full length of the causeway we have filled our basket, rejecting all except those firmly seated on small portable stones, or of the desired variety; and also on the margins of the bank have gathered a goodly number of the dark coloured scarlet fringed sagarts, either seated on small stones or occupying some deserted shell valve. Wading through the deep mud we reach the point where the wooden stage joins the ill-constructed stone pier; and, assuming a stooping posture, really back-aching work, for it will not permit of an upright position, we traverse it on our hands and knees to its lowest end where it just appears above the water. Troublesome and unpleasant as the task really is, it well repays the toil, for at almost every step we find clusters of the tubes of the sabella protruding through the lower stones, and on the old worm-eaten supports of the stage colonies of the plumose, of the bluish white and deep orange varieties; but as these are not so clear and pellucid as others we shall soon meet with, we leave them. After gathering a few choice scarlet fringed sagarts we again take to our boat and pass on to that portion of the Anglesey shore where Lady Bulkley's bathing house juts out on the margin of the Strait. Presently we find clusters of the exquisitely constructed tubes of that master of masonry the pretty little *Terebella*; then small specimens of the brilliant orange disked sagartia; turning the loose stones scores of the active and curious ribbon fish, who dexterously evade our grasp by diving from stone to stone; and after a walk of about half a mile, on a shore ever varying in its form of life, find ourselves on the first oyster beds, near the battery, and the Point of Beaumaris, whither our boat is slowly making its way. Just above the highest bed of oysters is a wide basin of sand mud, covered here and there with shallow pools of water. After a close observation for a few minutes we perceive we are surrounded by numerous cup-like orifices in the firm mud, from about the fourth of an inch to an inch and a half in diameter; these are the caves into which the troglodytes-like creature, the snake-locked Anemone, *Sagartia viduata*, has retreated, waiting the return of the tide, when it will stretch forth its long and elegant column to welcome the vivifying element. But, snugly as it has hidden itself from our gaze, we know the secret of its hiding-place, and at every turn of the spade have made one or more captives. With a quick movement we turn up a lump of the firm sand, and just where we had seen the cup-like orifice it separates, and on a small pebble, black as Erebus and discharging a perfume that speaks strongly of decomposed vegetation, is the now shrunken column and the button-like head of the beautiful *Viduata.* It is really a luxury collecting this lovely creature on this limited space—nowhere are they so abundant or so easily obtained, or in such great perfection. A second variety we shall find at a short distance from this prolific spot, but the tide has already surrounded us, and Captain Parry Jones's comfortable hostelry is at an easy and inviting distance, to which, by a most delightful road, we will wend our way and wait the retiring evening tide for further explorations.

Neither our personal appearance or that of the baskets containing our captives are very attractive; slime and decomposed sea-wrack are no embellishment, although we attract the glance, and perhaps something more, of the several groups of the fashionable seaside loungers as we cross the beautiful green to the old landing jetty. Doubtless we are the subject of many polite remarks that were not intended to be heard or transferred to these pages, and as the remainder of our baskets are handed from the boat for the purpose of plunging them in the bright flowing tide, a crowd gathers around us, and as they inspect the contents of these baskets, apparently only full of black, mud covered stones, with here and there a shapeless mass of jelly-like looking matter, wonder and amazement is depicted on every lovely face, and a contemptuous smile on those of the sterner sex; it requires all the courteous eloquence of Captain Jones—who is *the* most important authority on all matters relating to the Menai and its living productions—to persuade them that in a few hours these dirty, unsightly stones, these masses of slimy mud and various coloured lumps of gelatine will be, without the magician's aid, by merely a dip in pure sea-water, transferred into a magnificent bouquet of living composite flowers, truly animal flowers, that the richest bride might envy. Who could doubt Captain Jones—the sailing-master of Mr. Macandrew, the companion on many a long cruise of poor Edward Forbes, the trusted friend and pilot of many a learned savant? With laudable patience his wondering audience wait the result, and we are quietly permitted to plunge our baskets into the stream, free them from their objectionable covering, and transfer them into shallow pans of pure sea-water, to enable them to recover from the effects of our rough usage and to verify the captain's prediction.

Beaumaris is most delightfully situated, always presents a lively, clean, and charming appearance; occupying a beautiful, retired and sheltered nook, at the entrance of the Straits, and overlooking a noble bay, enclosed and bounded, at least beyond the Laven Sands, by the grandest mountain scenery of North Wales, which enables it still, as in Roscoe's days, "To be the resort of great numbers, in quest of health and pleasure. The rides and sea excursions are still not to be surpassed, and the accommodations very superior. The houses are well built, and the town presents a neat and cheerful appearance."

Although not noticed by Roscoe, there is much that will interest the tourist and antiquarian in the neighbourhood. The castle, a magnificent Edwardian ruin, built in the low situation of the "Beau Maris," offering a strange contrast to the bold sites of Conway or Carnarvon. Its history is very barren of great or stirring events. The road that skirts the sea to Penmon presents much that is interesting to the pedestrian and the naturalist, who rambles over the beach and past the Friars; he will do well by taking the upper road, when driven from his hunting ground by the tide on his return to the town. But, perhaps, with one or two exceptions, there is no beach, considering its limited extent and the comparatively unconfined rise and fall of the tide, that presents so many rare forms of life, and such facilities for collecting them as that we are about to explore,—the prolific strip of sand shingle and boulders that stretches from the Green of Beaumaris to the point opposite, Puffin Island. Descending to the beach, just opposite the Old Guard Station, and following the receding tide, we see protruding above the firm sand a dark coloured circular lump, covered with small pebbles and fragments of shells; we lift it with the point of the spade and find we have a small stone, generally egg shaped, covered with the tenacious sand mud; adhering to it by a sucking base is a fleshy bulb-like substance, about an inch to an inch and a quarter in diameter, the bulb connected to the broad base by a short tube-like round stem, less than half an inch in diameter. By plunging it into one of the numerous little pools of water, for a few minutes, we free it and the stone from its adhesive covering, and find the expanded base stem, or column, of a dull creamy white, shading to the swelling part of the bulb to a beautiful French grey, spotted with an intenser tint, which gradually deepens to a rich chocolate. This is one of the almost endless varieties of the lovely daisy, *Sagartia bellis*, in the contracted or closed state. In a few moments we have found a numerous cluster of others, either within a few inches of each other, or many so crowded together as to appear in their present closed state one animal; on lifting these we find several on the same stone completely covering its sides, ends, and upper surface, of the same variety as the one just named. But there are others of transcendent beauty, which are found in the same group, with a column of the richest cherry colour, gradually shading to rose pink, pink-white, blue-grey, and deep chocolate. Again, others with the column of pearl-white, varying in its shades from pale azure to the most delicate shades of green. We merely gather these as we pass on, having only seen them in their most unattractive form; we have not yet approached the garden of the daisy, where we shall find them as various as their floral namesake, and infinitely more lovely when in their full blossomed beauty.

We now pass the beds of the living oysters, and presently come to patches of shingle, from which beds of oysters have been removed; a shallow settlement of water always remains in these places covering the surface of the pebbles, old shells and loose stones, about one or two inches deep, and forming little trickling channels between other settlements of the beach. The eye soon becomes accustomed to the movements of the tiny fish, that dart about with frantic fear on our approach, and detects, peeping from between the interstices of the stones, the daisies, crowding themselves so closely in every favourable position as scarcely to give room for the display of their expanded flowers, their beautifully frilled or puckered tentacles mingling with each other. The colours of the expanded disks, and numerous and dense rows of short minute and fine tentacles are almost as various in their rich decorations as are the different shades of greens, chocolates, umber, brown, lavender, pale grey, cream-white, yellowish grey marked with broad bands of opaque white, black, reddish brown, and bordered with the same tints, of various shades, each mingling and blending into each other. The expanded flowers will frequently be found fully two inches in diameter, and of a beautiful salver shape; sometimes the outward rows of tentacles are gracefully curling inwards, or arching over the margin, forming an elegant puckered or frilled border. It has the power of greatly elongating or contracting its column, and is a most desirable tenant for the Aquarium, being



THE BIRTH OF THE SEA ANEMONE.

very active, freely expanding, and remarkably hardy. We now leave the garden of the daisy, and pass a wide extended area covered with small boulders, and thousands of exquisite specimens of univalve littoral molluscs; but as we are intent on gathering our garland of sea flowers, we merely give them a hasty glance and pass on to the two old deserted weirs opposite the Friars.

Almost the first object that attracts our attention is the second variety of the snake-locked Anemone, *S. viduata.* Mr. Gosse distinguishes it as *Var. melanops.* It is remarkable for having "A broad well-defined band of deep black crossing the disk and tentacles, just as if a dash of ink had been struck across the flowers, including in its breadth three or four tentacles of each row on each side. The band crosses at right angles to the line of the mouth, the gonidial radii of which are white." It obtains a much larger size, and is rarer than the *Var. aleurops.* But the object of our search is a very different and much rarer creature than any that we have yet added to our collection, and only known to inhabit two spots on the shores of the Menai; this appears to be a disputed point, Mr. Houldsworth having found a single specimen of a similar creature, the *Cerianthus membranaceus,* at the island of Herm, near Guernsey, and Doctor George Johnston describes one on the authority of the late Professor Forbes, as the *Act. vermicularis,* which is certainly not identical with the C. Lloydii of the Menai. The first name given to the vestlet, by Mr. Gosse, (*Ann. N. H. Ser.* 2, *xviii.*, 72,) *Edwardisia Vestita* was the proper one, or rather should have been that of *C. Edwardisia,* in honour of the gentleman who was doubtless its first discoverer.

I much regret that our great marine naturalist should have changed its name on no better grounds than the laudable persevering efforts made by Mr. W. Alford Lloyd to supply rare living animals to his *then* numerous aquarium patrons. I had the honour and pleasure of having it pointed out to myself in its own proper haunts, on this very spot by its first discoverer, Mr. E. Edwards, of Menai Bridge, who, during a long period of years, has been a most untiring collector, well meriting the honour of giving it his name, and who has forwarded many thousands of the Menai's rarest treasures to all parts of the kingdom. Without his instructions and able assistance I should never have been able to obtain the rare and beautiful *Cerianthus;* and although the occurrence has been named very briefly elsewhere,* it is a great pleasure to recall the circumstance back from the recesses of my memory.

On a fine June morning, a little before the break of day, he called for me in his boat, accompanied by his two boatmen (dear lovers of nature, and pupils of his own) at Garth Ferry. It was our intention, the morning being fine and calm, and the only favourable spring tide for some days, to pull to Puffin Island, being anxious to procure some *A. dianthus*, and the *Sagartia venustu.* On our approach to the island, as the tide fell the wind rose, coming from the north-west in fitful gusts, and presently there was a sea which rendered a landing on the only favourable point of the island totally impracticable. Never mind; it is only a tide lost! better luck some other time. Have you ever found the *Cerianthus?* enquires my excellent friend. No! Then after a few words in the old language of *Cymri*, the boat's head is brought round, and we are threading our way through gigantic boulders, sometimes scarcely passing over them without a dangerous bump, and are at last safely placed on the beach, a little above the two old weirs. A stooping position, perfect silence, a gentle foot fall, is the order of proceeding. Now the elder boatman approaches a little shallow basin of water in the firm hard sand, and holds up his hand and becomes perfectly stationary. Mr. Edwards points to a pencil of brilliant coloured filaments in the centre of the basin, and gently placing the sharp draining spade within the margin of the water, with all his force, drives it perpendicular through the sand, and in a moment has lifted the firm mass; but as quick and as dexterously as this operation was performed, it is still doubtful if we have secured the *Cerianthus*, for with the slightest movement, even the vibration of the sand, from a hasty step, it vanishes into its hole with the rapidity of the lightning's flash, and every attempt to secure it afterwards is fruitless and a waste of time, as it slips through its sac and is lost.

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* Stray Leaves.

But has our first attempt succeeded? The lump of sand is now carefully broken up, and forthwith appears a long leather-like tube, and gently feeling through its length until the end of the sac is reached, doubt still prevails. At last the curious and strange creature is pronounced to have been secured.

Our silent hunt continues as long as the tide will permit, leaving undisturbed many small or young specimens, yet securing upwards of a score of the choicest by precisely the same careful and rapid mode of proceeding, rarely or ever failing to capture the perfect animal. So rare and beautiful is this extraordinary Zoophyte, no doubt closely allied to the sabella and other tube dwelling annelids, that I do not hesitate to give Mr. P. H. Gosse's accurate diagnosis and exquisite description in *extenso.*

THE VESTLET.

Cerianthus Lloydii.

Specific Characters—Inferior orifice excentric: septa regularly graduated.

FORM.

Column. Greatly lengthened, cylindrical for the most part, but generally swollen at the inferior end into an elliptical bulb, and gradually expanding into a trumpet-shaped summit to about twice the medium diameter. No distinct margin, the summit of the column itself dividing into the tentacles, the ridges of which are apparent for some distance below the point where they separate. Inferior extremity pierced with a round orifice, which is placed at one side of the axial line. Mesentric prolongations of the visceral septa twenty-four, of which one pair are very minute, while the opposite pair extend to the immediate vicinity of the inferior orifice. From one to the other of these conditions there is a regular gradation in length, but from the longest to the middle pair the diminution is slight, while from the middle pair to the shortest it is great and rapid.

Disk. A deep funnel-shaped cavity, about twice as wide as the column, entire, circular, not overarching.

Tentacles. Of two kinds: First series strictly marginal, sixty-four set in two rows, alternating, but with their bases in mutual contact. They are equal, slender, conical, sharp-pointed, divided more or less conspicuously into knobs by some half dozen constrictions. Their contour is somewhat stiff, and they are generally carried arching upward and outward, but some of the inner row are frequently erect, and others inclined to a point over the disk. Second series remote from the first, crowded, in four irregular circles, springing immediately around the mouth, filiform, obtuse, sub-equal, not half as long or thick as those of the first series.

Mouth. A transverse slit; lip minutely furrowed, not projecting.

Investing Tube. Cylindrical, much wider than the animal, which is loosely invested by it without attachment in any part, papery or felty in texture, thick and soft, composed of many layers, the outer of which presents ragged foliations. The tube can be easily detached, when the animal immediately begins to form a new one by throwing off the material from the entire surface of the column; this at first is adhesive, tenacious, and very tough, pellucid, but gradually becomes milky, and finally opaque, entangling mud and sand in its substance. It is wholly composed of *cnidæ,* the discharged *ecthorœa* of which, in incalculable numbers and of great length, intertwine and form a sort of *felt.*

COLOUR.

Column. Pale buff or whitish, gradually becoming rich chestnut brown at the summit.

Disk. Pellucid white.

Tentacles. First series, maroon or chocolate-brown at the foot, above which pellucid whitish, with chestnut bands. Second series, dark maroon.

Size. Length seven inches, under strong irritation contracting to two; general diameter of column one-fourth of an inch; of disk half an inch; expanse of power one inch and a half.

"The animal is hardy in the aquarium, bearing even the confinement of travel with more impunity than many commoner species. It is large and handsome, with a striking and noble aspect, and as it lives habitually expanded, and manifests considerable vivacity, it is a very desirable acquisition. The appearance of its felty tube is, however, repulsive; but this I have found by no means essential to its comfort, and have managed to dispense with it by the following device:—Having prepared a glass tube of suitable size, by cementing it perpendicularly to a stone of sufficient weight to maintain its stability in an upright position, I carefully removed the animal's own case and dropped the denuded body into the new lodging. The *Cerianthus*, in every instance, became immediately at home, presently lengthened itself, and expanded at the margin of its new abode; and, as if the protection hereby afforded were sufficient, it threw off a new natural coat, only to such an extent as did not interfere with the sight of the body through the glass. Another advantage is secured by this treatment; for whereas, naturally, the animal burrows in the mud, so that only the expanded flower is visible, and when put into a tank sprawls uncouthly along the bottom, the upright glass tube exposes the entire animal to observation, while it is protected from injury. I have specimens now, which have been kept for many months in these circumstances, and are still in the highest condition."

"In handling the animal during the process of stripping off the coat, it contracts by strong sudden and repeated jerks, at each becoming shorter. In these contractions the water in the visceral cavity is forcibly ejected from the terminal pore. This is not placed at the extreme point, which is marked by a depression, and by the convergence of lines, but is considerably excentric; I have also seen water ejected at intervals by the same orifice, when undisturbed, and that so forcibly as to hurl the floating atoms to the distance of two inches. I am pretty sure that I have also seen an inflowing current; but this is more gradual, and therefore less conspicuous. The orifice must be considered as only a provision for respiration, and not as a termination to the alimentary canal: the half digested food is, as usual, discharged from the mouth."*

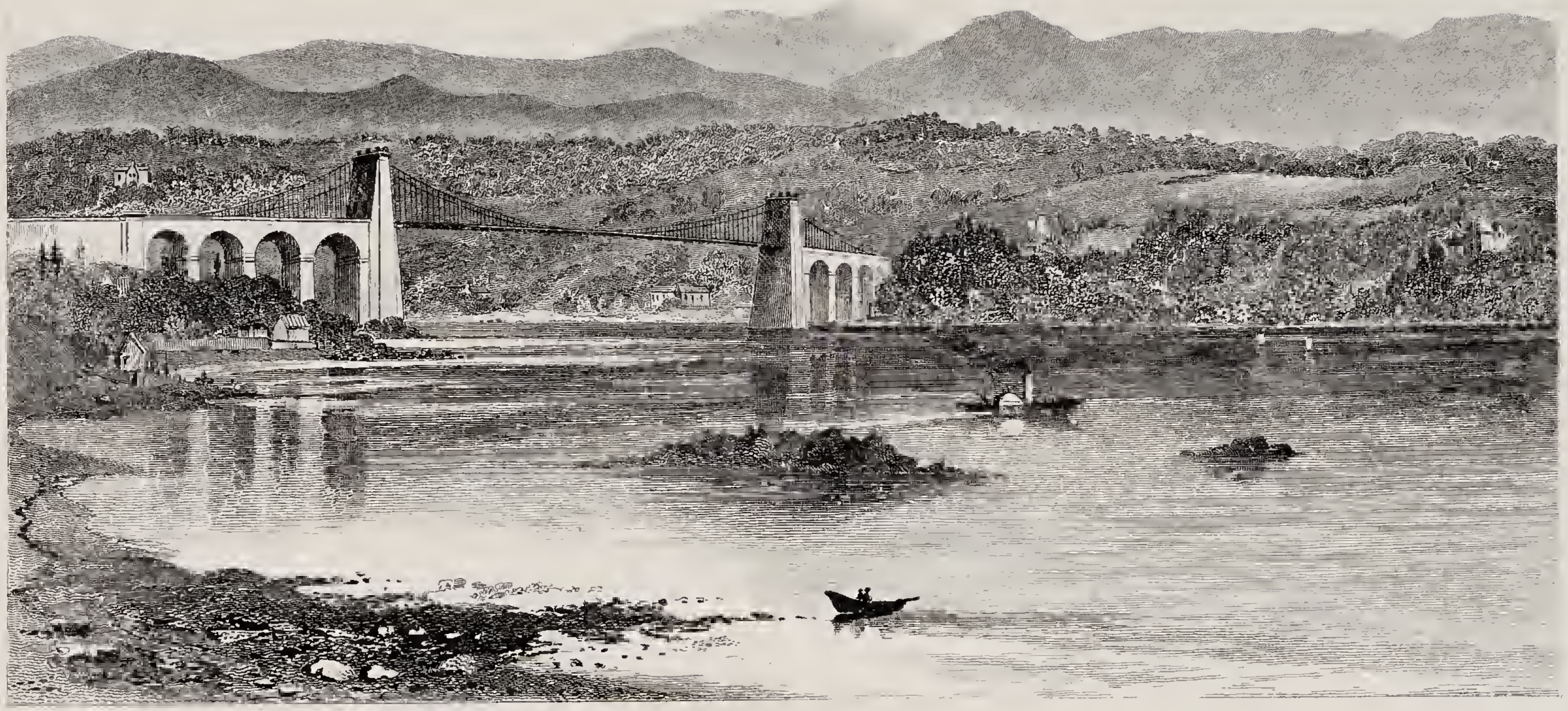
* Gosse's Actinologia Brittanica, 271.

That it is also a very voracious animal, and feeds freely in captivity, greedily accepting fragments of raw flesh, and also skilfully catering for itself, we have the testimony of the same indefatigable and accurate naturalist.

"One evening," he writes, "I amused myself with observing it capture its prey. It was one of those before-mentioned, set in an upright test tube in an old-established tank close to the side. The water contained a large number of *Entomostraca*, which, when the candle was placed near the tank, flocked from all parts to the light. I was thus able to direct the migrant crowd to any point I pleased, and so brought them, when pretty well assembled, to the quarter which the expanded tentacles of the *Cerianthus* occupied. One and another were continually coming into contact with the tentacles, and it was highly interesting to mark the unerring certainty with which each was arrested the instant it touched a tentacle. No matter whether the foot, middle, or tip of the organ were touched, the little intruder inevitably adhered as if birdlimed, and apparently without a struggle; when immediately, with the most beautiful ease and precision, the fortunate tentacle jerked inward—all the rest remaining as they were—and, delivering the prey to the grasp of the gular tentacles, in a moment resumed its expectant position. So numerous was the giddy throng that this manœuvre was every moment in practice with some or other of the tentacles, so that scores, certainly, of the water-fleas were captured while I was observing."

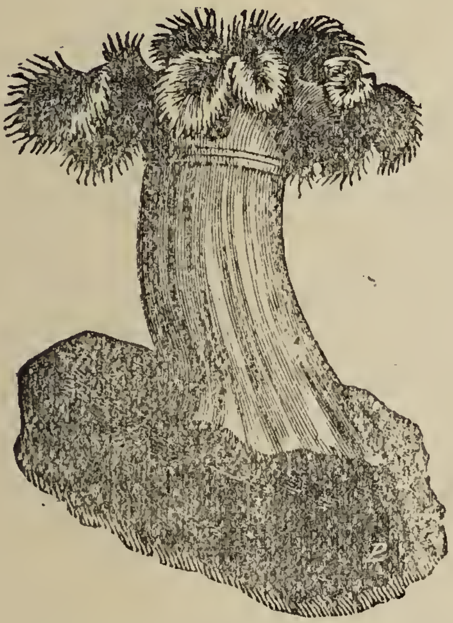
Making a slight descent a little beyond the lowest weir, and approaching the Anglesey quarries, we find ourselves in the midst of clusters, ranged on all sides of gigantic boulders. These, as a rule, when deeply bedded in the sand or shingle, are totally barren of every form of life, except barnacles and a few littoral shells. Towards the lowest tide marks, more especially spring tides, they take a wider range, and are more thinly scattered, and many of these are frequently found resting on one angle, or supported by smaller stones, allowing room for the ebb and flow of the tide underneath them, and often forming wide shallow basins of water. This ground, generally, is what is termed "the hard bottom," being merely a layer of shingle, sand, and the debris of shells above the firm tide-worn rock. Such positions the *Troglodytes*, *Venusta*, and other species of the *Sagartias* love to select for their dwellings. The *Troglodyte* or cave-dweller, generally so extremely abundant in some of its very numerous varieties, on most of our coasts, is rare on the shores of the Menai; and I have not been able to detect its presence except near the lowest tide marks, in well concealed situations amidst these boulders, and on a few patches of shingle beach near the opposite shore, beyond the Laven sands, and near the estuary of the Ogwin river. And it is also limited to one variety of the species. The tentacles of pale, dull, bluish-grey, or slate colour, banded with indistinct broad lines of opaque white, the column of a greenish slate or olive, marked with indistinct longitudinal lines. I have previously named the difficulty there is in detecting their presence by the uninitiated; the difficulty here is much increased; the expanded tentacles and disks so closely resembling the colour of the sand and shell of these boulder tide pools, that it is next to impossible to perceive them; but should some few have selected their caves beyond the margins of the pool, or places where the rocks are flat and interspersed with tracts of sand, their smooth worn ridges just creeping through, and where there is, what the Devonshire people call "a fleet," "that is an incline down which the water trickles gently to its level," all the difficulty in discovering them is at an end. On the margin of the pool, on the moist sand, will be seen a slightly elevated blue grey circle, with a greater accumulation of minute pebbles and broken shells than the other portions of sand present. This is the upper portion of the contracted button-like form of the Troglodytes. Others, where there is a thicker layer of sand and mud, will occupy a cup-like orifice, precisely the same as the snake-locked Anemone. There is little difficulty in securing these, and we will, before proceeding to the "fleet," extract them from their concealment. The length of their column seldom exceeds four inches, and in the fully contracted state rarely two, and we know (although they are sometimes found free, which is the habit of the mud loving kinds) they are generally attached either to a stone or by their suckers to a crevice of the solid rock. If on a stone there is not the least trouble in lifting it, but otherwise the sand or mud must be cleared away and the position of the base ascertained. If not in too deep a crevice, into which they shrink on the slightest alarm, they are easily removed with either the back of the thumb nail or the ivory paper knife; in the other case it requires the skilful use of the chisel removing the rock that surrounds them; by dividing its lamina we expose the entire shrunken animal, and detach it without the least injury. Those, where there is a "fleet," are usually found between the narrow ridges of the rock, with a sediment of sand nearly to its level, frequently numbers in a row, as though planted by some skilful gardener. The depth of these crevices are easily sounded by the chisel, as are likewise those in front and back of the *Sargats*. To remove them from a similar position, in a still tide pool, if it cannot be bailed out or drained, is almost impossible; the cutting away the rock obscures the water, as well as the creatures we are desirous to obtain; but the "fleet" is a most efficient aid; we commence at the upper portion of the stream and remove the ridge of rock, as a pavior would a row of stones in a well-paved street, the flow of the water clearing away the debris before it, and the Troglo's are exposed. Frequently by turning over the boulders an immense number of various creatures are obtained; but the Troglodyte is rarely captured. Adding these to our stores we have, with the exception of the almost unapproachable Puffin Island's *Fauna*, every species of the lovely sea flowers of the Strait of the Menai.

Puffin Island, otherwise *Ynys Seriol*, or Priestholme, situated at the entrance of Beaumaris Bay, and close to Penmon Point, is, always, except at one point, difficult to approach so as to effect a landing; and for the purpose of ascertaining and collecting its *fauna*, it is quite useless to make the attempt at any other period than when there is a full spring tide. The grand groups of the most exquisite pellucid *Dianthus* are only then fully exposed; and so it is also with the brilliant orange disked *S. venustas*, they are confined to one very limited space. One variety of the beadlet, the dark-red *Rubra*, also occupies the front of a perpendicular rock, in a deep fissure at the north-west or opposite angle of the island; and here myriads were to be seen at all times after the commencement of the ebb, dotting the rocks with their rich plumb-like cones, and, as far as the eye can penetrate into the clear transparent water below, are seen equal numbers of the fully expanded flowers. Perhaps the most convenient mode of approaching the island is, in the first place, to avail ourselves of the favourable shelter on the Penmon shore near the lighthouse, which can generally at all times be reached in a good powerful boat, and there wait the moment when a landing can be effected on the perch. If too soon for the tide, an agreeable hour can be spent by ascending the rocks to the summit of the island, and a most lovely prospect, on a clear summer's evening, is placed before us. The boatmen, or pilots, at the Penmon station, whose services it is wise to secure, are well stored with legendary lore connected with this isolated spot of rock and land. How, in ancient days, a sarn or causeway, existed between the island and the opposite coast—Orme's Head, and the dangerous shoals on which the Rothesay Castle was wrecked in 1831, was the site of this lost causeway. But we reach the summit, and find the ruins of an oblong tower and telegraph station; the tower, about forty feet in height, is evidently the remains of an ecclesiastical establishment, and similar to one at Penmon. There are also other fragments of building and remarkable places of sepulchre in the deep fissures of the lime stone rock. Our guides kindly remind us of the legend related by Giraldus Cambrensis, that upon any disagreement between the pious monastic brethren, the island was overrun and devasted with mice. Be that as it may, the Norwegian rat and a few rabbits hold firm possession, sadly to the annoyance of the sea-birds, to the present day.

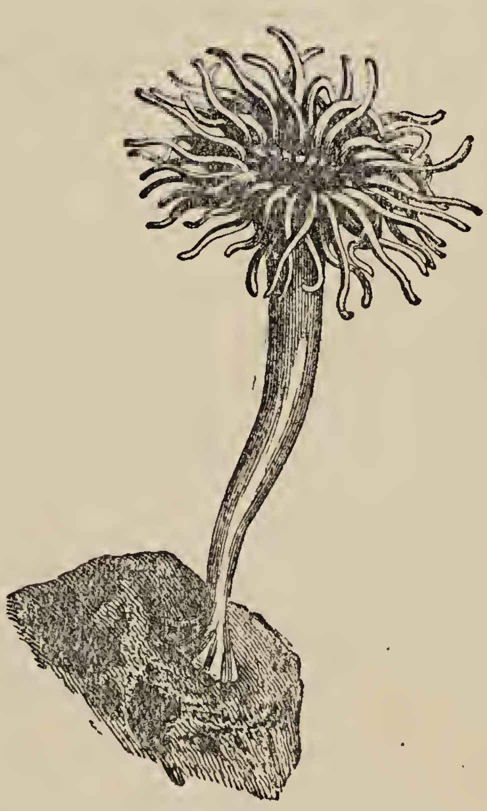


MENAI SUSPENSION BRIDGE FROM THE ROAD ON THE ANGLESEA SIDE LOOKING EAST.

But we must again descend to the margin of the tide which has left an extended area of rugged rocks, deep caverns, and immense piles of lime stone blocks open to our inspection; climbing over these is at all times a difficult and dangerous undertaking, but well does it repay the risk and trouble. Scrambling over rough, sharp, pointed ledges that will hardly give room for a footing, and turning over loose detacted fragments we find colonies after colonies of the Plumosa *Actinoloba dianthus*, surpassing not only in size, but in the transparency and brilliancy of its pure white colour, those found on any other portion of our coasts. No pen-picture can convey the exquisite beauty of these lovely creatures. The noblest of our native Sea Anemones, frequently exceed four inches in diameter and six in height of column. The great numbers that are often found forming one group on the surface of a small fragment of rock, excite our wonder and astonishment; and these to the number frequently of fifty and upwards of all ages, from the infant not larger than a peppercorn, to the full-grown and magnificent adult. The old shell-valve of the oyster or picten, or a water-logg'd plank, is also their favourite home; and sometimes



THE PLUMOSA, *(A. dianthus.)*



THE TRUMPLET, *(Aiptasia Couchi.)*

the finest single specimens are obtained in one of these valves. They are eminently a deep-sea creature, rarely found above low water mark, spring tides. It is no unusual occurrence to find monstrosities of this species, or double ones, that is with two disks springing from one column, perfect twins on one stem. Moving nearer to the caverns, and removing the tangles from the fissures of the lime stone blocks, in these, and occasionally on their angles, the grandly-coloured Venustas love to dwell; and they are here in all their perfection of rich brilliancy of colour, beauty, and size; their snowy border of numerous tentacles richly contrasting with their fine golden disk. Perhaps with one exception, the Gemmacia, no other British Sea Anemone is so chastely decked as the Venusta. But they are very difficult to obtain from the hard lime stone rock, and fortunate is the amateur naturalist who succeeds in finding them on the sharp angular blocks or portable stones; so ardently have we been engaged in cutting out a few dozens, that the tide has driven us to our boats without being able to secure more than a few of the choice and rare shells and other creatures, which are unusually abundant on this island rock. As we step into our boat the loud blowing of a giant Conger is heard, and the experienced ears of the boatmen tell them of his exact position. An exciting hunt is commenced under that flat rock there. Shove in an oar and a mighty splashing of the waters is seen; presently the writhing monster exhibits half its hideous length, and then another dart is made at him, but he eludes the blow, and quickly dives beneath the rock. Again he is roused in his lair, and the struggle commences in earnest, and continues until the rising tide is about to come to his relief; but unfortunately for his safety, he fearlessly protrudes his savage wide extended jaws and head beyond the opening in the rock; the battle is won, a well-aimed blow with the cutting edge of the spade, and the monster is secured. With a shout of joy and triumph the oars are shipped, and in the bright clear moonlight we row to the delightful beach of our temporary home, fatigued but gratified with our evening-tide hunt. No doubt the last captive was more highly valued by my willing aids, than the baskets of gems so carefully protected for future admiration.

A few words as to the mode of preserving these lovely creatures in health, previous to dispatching them to their final destination, and then we will turn our attention to the wonders to be found in the deep waters of the numerous banks and the Strait. The naturalist is never at a loss for occupation; when the tide will no longer permit shore hunting, the boat and the dredger are at his command.

DREDGERS.

Any kind of shallow vessel, after they have been carefully cleansed, will serve to contain our captives. The common delf-foot pan is well adapted for the purpose, but rather expensive. An equally suitable vessel, and much more portable, is the red clay-glazed Scotch stew-pan : it is strong, light, of a convenient shape, and can be procured of any size from four inches diameter to twelve, and of proportionate depth. The smaller size will answer our purpose, and can be packed eighteen in a hamper, when full of live stock or empty; but in case of need, milk pans, deep dishes, soup-plates, or finger and tumbler glasses will serve as a substitute. To avoid the trouble of constantly changing the waters, a well sheltered and protected rock pool or other safe position on the sea-shore should be selected, and within a short distance of mid-tide mark. Then securing a cover of the coarsest cheese-cloths, the pans can be placed securely in its depths, and to render them doubly secure in apprehension of bad weather, they can be loaded with large flat stones which are abundant on every coast. I have found pursuing this plan of the greatest advantage, and after the accumulations of many months' collections, when they have been withdrawn from these tide-pools, have ever found them in full vigour and health, even in the hottest months of the summer.

"Well it is," says the Rev. D. Landsborough, "for our marine marygolds, anemones, and china-asters, that our British gourmands have not learned to think them as grateful to the palate as they are pleasant to the eye. The Italian epicures boil many kinds of actiniœ in sea waters. They have a shivering texture when thus preserved, somewhat like calf's foot jelly; their smell is somewhat like that of a warm crab or lobster, and when eaten with sauce they form to their taste a savoury repast."

As long as we can get a good herring or haddock out of the sea, I am not apprehensive of the contents of my Scotch stew pans being defiled by the hands of cooks, and that the most tempting of our lovely actiniæ may be permitted to bloom unscathed in all their beauty.

CHAPTER IV.

"Art's finest pencil could but rudely mock
The rich, gay lichens, broidered on a rock;
And those gay, watery grots he would explore
—Small excavations on a rocky shore,
That seem like fairy baths, or mimic wells,
Richly embossed with choicest weed and shells,
—As if her trinkets Nature chose to hide
Where nought invaded but the flowing tide."

JANE TAYLOR.

"The bridgroom sea
Is toying with the shore, his wedded bride,
And, in the fulness of his marriage joy,
He decorates her tawny brow with shells,
Retires a pace to see how fair she looks,
Then, proud, runs up to kiss her."

ALEX. SMITH.

SEA-WEEDS AND SHELLS.

If old ocean has its gardens of lovely flowers, and the rocks their coronet of rainbow-coloured shells, it has also its forests of gigantic vegetation, and green, luxuriant meadows of waving sea grass. It is but a mere sketch, a faint outline of Marine Botany, that my space admits of; even if I had the ability to treat a subject of such vast interest fully, it would occupy this and many succeeding chapters. But there is little cause for regret; for those who are desirous of a more detailed history of our marine vegetation, can obtain the fullest information from books written expressly on the subject by the late Professor Harvey. His "Phycologia Britannica," containing coloured plates and full descriptions of all the British Sea-weeds; also, his "Manual of the British Marine

Algæ," and "Sea-side Book," from whose pages I have culled nearly all the information I possess, and the principal details of this chapter.

Only a very few years have elapsed since any book on the study of sea-weeds would have been treated with contempt, and within the last fifty years some of our learned academicians treated them with the greatest disdain. Landsborough states that he heard of a student about that period who, having collected some beautiful Algæ on the shore, showed the contents of his vasculum to the Professor of Botany, whose lectures he attended, expressing a wish to get some information respecting them. The Professor looked at them, and putting on his spectacles, again looked at them, when, pushing them from him, he exclaimed, "Pooh! a parcel of sea-weeds, sir; a parcel of sea-weeds!" Even those princes of poetry of the Augustan age treated them with equal contempt; and the tasteful Virgil, when speaking of something which he regards as worthless and filthy, says that it is *Alga projectâ vilior*, "viler than the sea-weed cast out on the shore." Its very calamities are turned against it. "*Refunditur Alga,*" says another poet, "the sea loathes it and flings it out on the shore." Alas, for the poor sea-weeds; but still they have had their *facile Regina*—Mrs. Griffiths, of Torquay—"the willingly acknowledged Queen of Algologists;" and poets, too, have sung of their beauties:

> "Call us not weeds—we are flowers of the sea,
> For lovely and bright, and gay-tinted are we;
> And quite independent of culture or showers,
> Call us not weeds—we are Ocean's gay flowers."
>
> ANON.

The rock and the sand have each their peculiar forms of vegetation as well as animals. The marine plants which occupy sandy shores are not numerous, but generally, as far as the lowest tide mark, bare of vegetation—though a great variety may be picked up of very beautiful kinds upon the beach after a gale. These come from deeper waters, either where the sand is more compact than on the shore, or where masses of rock interrupt its continuity and afford a site for a colony of sea-weeds.

The Grass Wrack, *Zostera marina*, whose creeping stems, rooting at the joints, admirably fit it for establishing itself on loose sands and forming the nucleus of a soil on which other plants may grow. Its long, riband-like leaves, of a brilliant green colour and satiny lustre, waving freely in the water, afford shelter and nourishment to a host of marine animals and plants. Great numbers of epiphytic sea-weeds, of small size, many of them of exquisite beauty, may be collected on the leaves of the *Zostera*, which are frequented also by numerous zoophytes, and by the smaller gasteropodous mollusca. A *Zostera* bed is, therefore, always worth examining, and when it grows beyond the reach of the tide, having to be raised by a raking instrument, which will be fully described further on, it is found to be well clothed with sea-weeds and zoophytes.

SEA ANEMONES.

The success of the zoologist and algologist in collecting specimens, in either branch, depends more on the extent of surface uncovered at low water mark, and on the outward conformation of the rocks of which the tidal margin is composed, than on the geological structure of the district.

"Soil," remarks Professor Harvey, "in some measure affects the vegetation of sea plants, but not to any great extent. The roots of sea plants bear little resemblance to those of land plants. Few are fibrous, and few indeed send out extensive bundles of fibres to seek through a varying soil the substances necessary for their perfect growth. The roots of sea-weeds must be regarded more in the nature of holdfasts than as separate organs contributing to the nourishment of the body. With this end in view nature furnishes sea-weeds, in the great majority of instances, with a simple conical disk, by which they strongly adhere to the smoothest surface; and when a more root-like holdfast is given, it is merely a multiplication of such disks, or strengthening by lateral ropes the original grip taken of the rock."

I have in a former chapter taken a rapid survey of the vegetation and animal life which characterise the *littoral zone*, or that belt of rock or shingle which extends from high water mark to low water mark. Within this space a large portion of the sea-weeds of our latitude is produced, and the remainder, with the exception of a few stragglers that extend into deeper waters, seem confined within the limit of two, or at most four, fathoms beyond the lowest water of spring tides.

Professor Harvey, and other botanists, usually class Sea-weeds in three great groups, each of which contains several families, which are again divided into genera, and these in their turn are composed of one or more species. The number of species as yet discovered on the British coasts is about three hundred and seventy, and they are grouped into one hundred and five genera.

Taking them in the order in which they present themselves to us on the sea-shore, and limiting each in its most obvious character, that of colour, we may observe that the groups of Green Sea-weeds, *Chlorospermeæ*, abound near high water mark and in shallow tide pools within the tidal limit; that the Olive-coloured *Melanospermeæ* cover all the exposed rocks, feebly commencing at the margin of high water, and increasing in luxuriance with increasing depth, through the whole belt of exposed rock; but that the majority of them cease to grow after they reach a depth which is never laid bare to the influence of the atmosphere; and the Red Sea-weeds, *Rhodospermeæ*, gradually increase in number, and in purity of colour, as they recede from high water mark, or grow in places where they enjoy a perfect shade or nearly total absence of light, and are never exposed to the air or subjected to a violent change of temperature.

The Green Sea-weeds, Professor Harvey tells us, "are the simplest in structure and the least varied in species, and, consequently, the least interesting to collectors of specimens. With the exception of the beautiful genus *Cladophora*, which contains about twenty species, our British *Chlorosperme* are chiefly composed of *Ulvæ* and *Enteromorpha*, whose forms vary with so little order that it becomes difficult, and, in some instances, hopeless to attempt to classify the varieties. The *Enteromorpha* are the first to make their appearance about high water mark, covering loose boulders of smooth rock with a slippery vesture of bright green, or filling the shallow tide pools with grassy fronds. These plants consist of tubular membranes, simple or branched, appearing to the naked eye like fine green silk, and showing to the microscope a surface composed of minute cells full of granules. The commonest species near high water mark is *E. compressa*, which commences with a very stunted size and thread-like branches if exposed to the air, but gradually acquires length and breadth as it grows in deeper water. When fully developed it has a frond divided nearly to the root into many long sub-simple branches, which have a second or third series, all of them much attenuated at their insertion and more or less distended at the extremity. The diameter of the tube varies considerably, and the broader and simpler individuals are only to be known from *E. intestinalis* by their being branched, the tube in the latter species being absolutely simple.

"To the *Enteromorpha* succeed *Ulvæ*, distinguished from *Enteromorpha* merely by being flat instead of tubular. The beautiful lettuce-like plaited leaves found in tide pools belong to plants of this genus, the commonest species of which is the *U. latissima*. It has a very broad, more or less ovate, plaited leaf, of a brilliant green, and remarkably glossy when in perfection, reflecting glaucus tints if seen through clear sea water, and is certainly a very ornamental species."

We will now pass to the most elegant of little marine plants, the *Bryopsis plumosa*, which consists of a multitude of soft green feathers, gracefully connected together. Its substance is exceedingly flaccid, and the branches fall together when removed from the water, but immediately expand on re-immersion. Few of our marine plants are more beautiful, and the pleasure of admiring its graceful characters may be infinitely prolonged. Like the preceding *Ulvæ*, it is one of the plants which may be most easily grown in the aquarium; while it continues to vegetate it will keep the water sweet and pure, and needs no care. The *Bryopsis*, in all its characters, has the structure of a vegetable, nor does it much resemble the zoophytes in aspect; and yet it is one of those plants which closely link the lower members of the vegetable kingdom with those of the animal, to which, in their place, due attention will be given.

I will only follow our talented algologist through a few of the more common of the Olive-coloured groups of Sea-weeds, or *Melanospermeæ*, so-called because their reproductive grains or spores are of a dark colour, or so opaque that they appear dark when seen by transmitted light. This group consists of much more perfectly formed plants than those we have just noticed. They are also commonly of much greater size, and the largest of all sea plants belong to them.

The Olive Sea-weeds commence to grow, as I have already said, just within the margin of the tide, and they extend throughout the whole of the littoral zone, and to the depth of one or two fathoms below low water mark.

The first species we meet with is *Fucus canaliculatus*, the smallest and most slender of the British Fuci. It grows in scattered tufts, one or two inches high, on rocks, about high water mark, and is at once known by having narrow, channelled stems and branches without air vessels. It rarely grows in water of a greater depth than three or four feet, and never in places where it is not exposed for several hours daily to the air. To it succeed *Fucus nodosus*, a large, leathery species, with thong-like stems, distended at intervals into knob-like air vessels, and covered in winter and spring with bright yellow berries; and *F. vesiculosus*, a more membranous kind, having a forked leaf, traversed by a midrib, and bearing numerous air vessels, in pairs, at either side of the rib. This species is gregarious, covering wide patches of rock from a foot or two below high water to low water mark. Growing thus at different times in a very different depth of water, it varies greatly in size. The specimens found near high water are small and generally without air vessels, these organs not being required to float the plant in shallow water; while all that grow in deep water are abundantly supplied with them, have fronds several feet in length, and stand erect in the water, buoyed up by the air vessels.

About the level of half-tide a fourth species, distinguished from all the rest by its toothed margin and the absence of air vessels, abounds on all the rocks to the limit of low water, growing like the *F. vesiculosus* in society. These four species are all the true Fuci that are common to every part of the coast, and that impart to the vegetation of the rocky sea-beech its peculiar olive-brown character.

Close along the margin of the sea, either above or below high water mark, may be seen on most rocky shores small, circular, somewhat scurfy patches, consisting of minute, rigid, branching plants, which when dry look perfectly black, but on return of moisture exhibit a clear olive tint, while the tissues soften and the frond becomes pliable. The patches I allude to consist of two species, or varieties, of the genus *Lichina*, the smaller one, *L. confinis*, growing just above high water mark, where it is wetted by the tide without being submerged; the larger, *L. pygmæa,* growing in places inundated by every tide.

These little plants have sometimes been considered as *Algæ,* and sometimes as belonging to the class of *Lichens.* By those who regard them as *Algæ,* they are placed in the group of *Melanospermeæ,* but their fructification little resembles that of any of the genuine members of this group, while it has a considerable affinity to that of many lichens. Their submarine locality alone connects them with the *Algæ.*

About the limit of ordinary low water, to the depth of one or two fathoms, and beyond that limit, the rocky shore is fringed with a broad belt of luxuriant sea plants, mostly consisting of the family called *Laminareæ,* among which some of the *Fucoideæ* and a great number of the Red Sea-weeds, find a favourable locality. The *Laminareæ,* or oar weeds, are the largest of all sea plants. Their stout, woody stems, and broad, ribbon-like, glossy leaves must be familiar to every one. When seen in clear water, as we pass over them in a boat, they form a picture resembling a miniature forest of palm trees, as their great fronds stand expanded in the water, while fishes swim in and out among the flat branches. In our climate they do not attain a length of more than twelve or fourteen feet, and even at this size the weight of a single frond is very great. But these are pigmies compared to some of the gigantic *Laminareæ* of the Southern, Pacific, and Atlantic oceans, where great trunks, twenty feet long and upwards, support huge branches of leaves that form, when expanded, a circle of equal diameter.

Necessarily, these sketches of my wanderings must be comparatively brief, and minute details cannot be given. My sole object is to point out, as we proceed, the most peculiar forms of ocean life, and to indicate the path that leads to their discovery, by rendering familiar their well-known forms to those who are desirous to obtain a more perfect knowledge of their growth and habits.

Therefore, with a short account of the beautiful Red tribes of Sea-weed, or *Rhodospermeæ,* so exquisitely described by Professor

Harvey, I shall conclude this hasty sketch with a few brief extracts from his noble work, and pass to another branch of the subject—for

> ————————" Who can paint
> Like Nature? Can Imagination boast
> Amid its gay creation hues like hers?
> Or can it mix them with that matchless skill,
> And lose them in each other as appears
> In every bud that blows?"

The Red Sea-weeds are by far the most numerous in species, and the most perfect or elaborate in structure, of all the class of *Algæ*. They also characterize a greater depth of water. Many of these grow beyond the influence of the tide, and can only be procured by the dredge, except when a strong gale throws them up on the beach. The majority grow close to low water mark, and are to be seen only for an hour at spring tides, so that a person visiting the shore at neap tides may leave it ignorant of half its treasures. The favourite locality of the more delicate *Florideæ* (as the *Rhodesperms* are frequently called) is on the perpendicular sides of deep rock pools, under the shade of larger plants.

This is the usual position of the various species of *Griffithsia*, some of the most beautiful of the filiform *Alga*. Where the pools are not shaded by large plants on the margin, the northern aspect will be found most fertile, especially when ledges of rock project beyond the rest. Such is the favourite locality of *Delesseria sanguinea*, whose beautiful rosy leaves, veined with darker striæ, are the delight of amateur collectors. Most of the Red Sea-weeds flourish in clear water, but there are others—the most delicate of the filiform kinds—whose stunted pennated fronds, when laid out on paper, resemble minutely beautiful tracery work, and mock the attempts of the pencil to do them justice, flourish in places where a coating of mud covers the rocks, or where the water is habitually muddy. The only other *Rhodespermeæ* which I shall at present notice is, the very curious tribe of *Corallineæ*—the jointed Corallines of Linnæus: plants which have been regarded since the time of Ellis as members of the animal kingdom. This tribe is most numerous in species as we approach the tropics, but the British examples are not many, excepting the *Corallinea officinalis,* which is so common on all our coasts, that it must have attracted the notice of every one who has paid any attention to marine productions, and it will serve as a type of the family. It will at once be seen that this plant differs from other Sea-weeds in being of a calcareous nature, effervescing when thrown into an acid solution, and in this respect it resembles a true coral. It neither produces polypes, however, nor exhibits any animal character, while it yields spores contained in receptacles perfectly analogous to those of the *Algœ* of the red series, to which its colour also allies it. These spores were observed and figured by Ellis, and it is, therefore, the more strange that the vegetable nature of the family has not been earlier acknowledged.

The great elegance of many of the Sea-weeds, and the ease with which specimens may be preserved, retaining much of their original beauty, attract many persons who occasionally visit the sea-shore; and Sea-weeds are collected either as objects of scientific interest, or for the manufacture of pictures for albums or screens.

Those who collect Sea-weeds for the latter purpose, care little to know their history; but, perhaps, when some of its facts are known they may be regarded as not without interest. I have, therefore, mentioned some of the principles on which the classification of these plants is based, and described some of the commoner species of our shore, following, almost word for word, the great algologist, to whose works, before-mentioned, I must refer you for a more detailed history of the family.

But nature, in providing this bountiful vegetation of the sea, gives both shelter and food to an infinitude of animals. "Were we to speak," says the same eloquent author, "of the *uses* of Sea-weeds, and confine ourselves to their adaptation to the wants of man, we should much misinterpret the office which this portion of the vegetable world discharges in the general economy. However useful to man, they are absolutely insignificant in comparison to those benefits for which the lower tribes of animated nature are indebted to the Sea-weeds."

Troop after troop of animals, one more highly organized than another, either derives its nourishment from the sea-weed itself or uses the submarine forest as a hunting ground, where it fulfils the appointed course of its busy life. Adhering to the roots of Sea-weeds we find the scarcely organized, but obviously animated, sponge, whose place in the scale of creation seems so nearly balanced between the animal and the vegetable, that naturalists have debated to which of the kingdoms it properly belongs. To the stems and leaves adhere multitudes of incrusting animals, some of which, till we examine them somewhat closely, and watch their animal motions and propensities with some care, seem to consist merely of masses of jelly; while others display in their outward forms the branching appearance of mosses, every branch clothed with scales, and crowned, when the animal is in vigour, with starry flowers. The rocks from which these Sea-weeds spring afford a resting-place to stationary animals, which, in the sheltered submerged groves, watch the approach of prey; and through the branches, in every direction, tribes as different from each other in form and structure as it is possible to conceive, sport, and multiply, and contend in ceaseless motion. No spot of rock is absolutely a desert, and no Sea-weed grows that does not support its multitude of living things. The zoologist, therefore, on every rocky shore may find abundant occupation, and he who does not limit himself to the mere collection and determination of new species, but enters into the more noble departments of his science—anatomy and physiology—will in the most barren places find animals, the investigation of whose history will afford him constant sources of pleasure.

The transition from Algologia to Zoology is simple. We have seen that Johnston arranges zoophytes in two classes, the ANTHOZOA and POLYZOA. The *Anthozoa*, which have a body capable of contraction in every part and perfectly symmetrical, with a single aperture for the entrance of food and for evomition; and the *Polyzoa*, whose bodies are unsymmetrical and incapable of contraction, while they are furnished with a separate mouth and vent. The first are obviously akin to radiate animals, while the latter show a close resemblance in structure to the simpler members of the mollusca.

The *Polyzoa*, though of much smaller size than many of the *Anthozoa*, are much more perfectly organized and of a higher type in animal existence. In the compound *Anthozoa*, the individuality of the Polypes is not clearly maintained, but each, as it were, a bud issuing from a common fleshy trunk of similar substance; while in the *Polyzoa* every individual is distinct within its own precincts, though connected like the Siamese twins by a common band. Dr. Johnston aptly compares the former to "a chain of which all the links are welded," the latter to "a necklace where the beads are strung together by a common thread."

The *Anthozoa* are divided by Dr. Johnston into three orders, easily recognisable by the nature of the skeleton: 1st., *Hydroida*, having Polypes enclosed in horny, tubular, plant-like sheaths, forming an external covering to their trunk; the 2nd, *Asteroida*, a calcareous, or horny axis, or internal skeleton, surrounded by the fleshy parts of the compound body; and the 3rd, *Helianthoida*, having a calcareous or coriaceous skeleton, composed of plates radiating like the gills of a mushroom towards a common centre. It will only be necessary to notice here a few belonging to the order *Helianthoida*, which are of a very different description to all the other species of the several other orders, and which will be noticed in their proper geographical position, being solitary and simple Polypes.

The commonest and most known of these are the Sea Anemones, a few of which distinct species and their varieties we have found on these shores. When the Sea Anemone is left dry by the retiring tide, it withdraws its tentacles from view by retracting them within the mouth, and the whole body shrinks into a conical lump of wrinkled, jelly-like looking flesh. Some few are very beautiful even when in this state. The same happens if the creature be touched with a finger while expanded. Were we to form an idea of the beauty of many species by inspecting them in this state, we should have little cause to stop and admire them.

But placed in water, as we have seen, and allowed to recover themselves, few marine animals are more beautiful than the various kinds of these Actiniæ.

They have been aptly compared to the flowers of Mesembryanthema, with their myriads of lustrous petals forming a starry whole. Here the tentacula, which surround the disk in many rows, represent the petals of the flowers, or may be likened to the "rays of glory" in the passion flower; and in the brilliancy of their colours and the lustre of their substance they much exceed their vegetable analogies.

The internal structure of the Sea Anemone is very curious. The polypes of the *Hydroida* are exceedingly simple in structure, their flesh being composed of a homogeneous mass of cells heaped together and formed into a bag-like body. In these *Helianthoida* the structure is much more compound; there is an outer leathery skin, separated from the inner coat or wall of the stomach by a hollow space, in which are placed numerous vertical partitions or laminæ, radiating towards the centre like the gills of the mushroom. These plates have their origin on the inner surface of the leathery coat, to which they act as a support, and some of them project so far as to touch the walls of the stomach; others are narrower and shorter than the rest, exactly as we find the gills of a mushroom. A similar structure is found in the stony Madrepore. But in the Sea Anemone the laminæ continue fleshy during the life of the animal; in the Madrepore, they secrete a coating of carbonate of lime, which thickens by degrees, and at length forms a stony cast of the animal. The lower parts gradually die away as the stony matter increases, while the polype body, continuing to live, is pushed upwards; and thus the corals of this family are produced.

In the seas of tropical and sub-tropical countries, the species of calcareous corals of the *Helianthoida* are exceedingly numerous, and their office in the natural economy most wonderful. Ceaselessly, from the earliest ages of the world, they have gone on withdrawing lime from the waters of the sea and fixing it in their tissues, till not mountains or islands merely, but whole continents, have been formed by their *debris.*

In our British seas but few examples of this section af zoophytes remain, but we have still types of these insect architects and conquerors of the ocean surge. What a deep impression these puny workers made on the mind of that indefatigable missionary, Mr. Williams, we gather from his delightful account of his enterprises, and the eloquent and admirable application he drew from their contemplation when he states that—

"The great object for which all knowledge should be sought, and for which it ought to be employed, is to illustrate the goodness of the great and beneficent Creator. And if we come to the study of natural phenomena with minds unchilled by scepticism or infidelity, we shall be led to sublime religious contemplations; and whether we examine the little coral insect of the ocean, or gaze upon the gigantic beast of the forest; whether we study the little glowworm that twinkles upon the bank, or the celestial luminaries performing their appointed evolutions in majestic silence, amidst the vast expanse of infinity, with an ancient and scientific king we shall be led to exclaim, 'How manifold, O God, are Thy works! in wisdom hast Thou made them all.'

"In all our prying researches after knowledge, it is necessary that the mind be firmly established upon two great points—the belief in a Divine creative agency and in the Divine authenticity of the sacred Scriptures; having a thorough conviction of the truth of the facts recorded, and of the correctness of the principles laid down. Without these, our minds will be led into a dark mysterious void, instead of having our thoughts carried up to the Father of light and of life.

"With these principles as our ballast we may launch our bark, without any apprehension of danger, upon the broad ocean of science, explore its coasts and fathom its depths; but, destitute of them, our vessel will be in a perpetual storm, amidst rocks and shoals, without a rudder, a compass, or a chart.

"Thus equipped you may accompany the geologist into the bowels of the earth, and examine its wondrous structure; and you will return with an overwhelming conviction that the 'Eternal God made the earth by His power, that the pillars of it are His, and that He has set the world upon them!' With the astronomer, you may ascend the skies, contemplate with ecstasy the movements of the heavenly bodies, and with the scientific Psalmist you will exclaim, 'The heavens declare the glory of God, and the firmament showeth His handiwork.' With the voyager, you may visit distant climes, and, viewing man in all his multiplied and varied characters, you will be convinced that 'God hath made of one blood all nations of men for to dwell upon the earth.' Thus it is, that in every age the evidences of revealed religion have advanced with the progress of sound knowledge. Indeed, it cannot be otherwise; for the God of nature, whose operations it is the province of science to explore, is the God of the Bible; and, as the God of truth, He cannot set forth in His word principles at variance with those which, as the God of nature, He has established in the material world. Both systems of knowledge, thus emanating from the same source, *must* harmonize with each other; for the Bible is something like a new edition of the book of nature, with a splendid appendix, which makes known the wonderful scheme of human redemption. If there is any apparent discrepancy in these two editions of this same great work, it arises from our inability rightly to decipher the characters employed."

The powerful and penetrating mind of John Ellis was filled and expanded with this sublime idea. The pleasures, the refining joys, attending the study of nature, and the beneficial results, we gather from his own eloquently expressed thoughts—

Nunquam allud natura allud
Saplenti decet.

"And now it should be asked, granting all this to be true, to what end has so much labour been bestowed on the demonstration? I can only answer that, as to me, these disquisitions have opened new scenes of wonder and astonishment, in contemplating how variously, how extensively, life is distributed through the universe of things, so it is possible that the facts here related, and these instances of nature animated in part hitherto unsuspected, may excite the like pleasing ideas in others; and, in minds more capacious and penetrating, lead to further discoveries, further proofs (should such be wanting) that One, infinitely wise, good, all-powerful Being has made, and still upholds, the whole of what is good and perfect; and hence we may learn that, if creatures of so low an order in the scale of nature are endued with faculties that enable them to fill up their sphere of action with such propriety, we likewise who are advanced so many gradations above them, owe to ourselves and to Him who made us and all things, a constant application to acquire that degree of rectitude and perfection to which we are also endued with faculties of obtaining."

From Zoophytes we pass by a very easy transition to the more simple members of the MOLLUSCA, those forming the subdivision *tunicata.* They are so called because their soft parts are enclosed, not in a shell, but in a tough, leathery coat, or tunic. The commonest example of a tunicated mollusc is found in various kinds of *Ascidæ*, or Sea Squirts, some of which are found attached to sea-weeds and stones in the littoral zone; others are frequently thrown up from deeper water on the beach, and are obtained by the dredge in great abundance in almost any locality. These Ascidians are among the humblest members of the great class of molluscs, commencing with their shapeless bag, proceeding thence through the bivalve shells into sea slugs; and so through the various tribes of univalve shells, we pass under review a great variety of animals, rising in complication of structure, one above another, until we arrive at the Nautilus and the Cuttle-fish, which close the great group by a type of structure in which the peculiar organization of the vertebrate is dimly sketched. The lowest mollusca are scarcely more organized than the zoophytes; the highest closely border on the most perfect animals.

The study of this class, remarks Professor Taylor, is in all respects highly important. To the mere student of comparative anatomy it offers a rich field of research; for here within circumscribed bounds he can trace the gradual development of organs, from the first idea as it were to their full perfection. To the collector of beautiful objects the countless varieties of shells so easily preserved, and so varied in contour and colour, afford continual sources of interest, and their proper classification a pleasant problem for the exercise of ingenuity; although it must be admitted that the proper classification of shells cannot be arrived at if the nature of the animal which forms them be not carefully studied.

Conchology within a few years has made more advances in a philosophical direction than most other natural sciences. Up to a recent period it was the lowest of all scientific pursuits, and appeared the most useless. Now, however, that the subject begins to be studied on better principles, a new light has burst upon it and a thousand interesting facts in the lives of the shell-coated animals are revealed; nor is the interest which attaches to them merely derived from our increased knowledge of the habits and instincts of an extensive class of animals. Its bearings on geology places it among the most important of the minor divisions of zoology. Shelly-coated mollusca have existed in the waters of the sea and of rivers from a very early period of the world's history, and have left in most stratified rocks and gravels abundance of their shells, preserved in a more perfect manner than the remains of most animals. Now, as the species in the early rocks differ from those found in later formations quite as much as the latter from the mollusca of our modern seas, the gradual change in the character of the imbedded shells marks a certain interval of time in the world's history. To understand and apply the evidence derivable from this source requires a most careful study, not only of the different forms of fossil shells, but of the forms and habits of existing species. In fact, it is impossible to understand the character of these fossils without an intimate knowledge of conchology. To distinguish species—to insist on minute characters, to collect minute shells—appear often to the unthinking utilitarian but trifling hobbies of mere triflers. Yet, on these apparent trifles depend some of the most important problems of geology, and if the conchologist blunders in reading the "Medal of Creation," all the deductions of the geologist will be vitiated. To trace the history of a species of shell from its first appearance in an early bed to its final extinction in a later formation, requires an intimate knowledge, not merely of the species in question, but the changes which under modified circumstances other species undergo before the vitality yields to an altered condition. It is a highly curious fact that there is a term to the life of a species as well as that of an individual. What that term is we do not know, but the remains of extinct species and genera prove the fact.

The *sands* and the rocks have each their peculiar divisions of the mollusca. On the first we find a great majority of the bivalves; on the second very extensive groups of *Gasteropodæ.* So large a class necessarily includes animals of very different aspects and variously modified structure, which it becomes necessary to classify on some principles derived from their organization. The classification usually adopted is founded on the differences in the shape and position of the gills or breathing apparatus.

"The molluscs possess in general a complicated digestive and circulating apparatus. The great bulk of their bodies is made up of the stomach, the liver, and other members of the alimentary system. Indeed most of the molluscs are condemned to a sedentary life; very few can move at all, and these but sluggishly. Hence the whole class is endowed with the power of sustaining long fasts, for not being able to go in search of their food, they are dependent on the capricious bounty of the waves and currents. In the great majority of the molluscs the mantle is capable of secreting first a horny covering; from this exudes calcareous matter, which forms the shell. This shell is thick and massive in those species that are incapable of motion, but light and fragile, and often altogether absent, in those which lead a more active life."

Linnæus divided the race into *univalves, bivalves,* and *multivalves,* according to the number of pieces of which the shell was composed. But further examination proved this simple division to be very unsatisfactory, inasmuch as it did not include many that are shell-less; besides other differences and similarities in the various species that are so essential to their proper classification.

This chapter would be extended too much were I even to glance at the other groups of animals found on almost every rocky seashore. Therefore, I cannot close these introductory remarks more appropriately than in the words of Professor Harvey, from whose works I have made so many copious extracts :—

"If naturalists too often neglect the true *use* of this knowledge, and rest satisfied with the knowledge itself, the fault and the loss is their own loss and must not be charged to science. It is enough for her if she but furnish food which is capable of nourishing the well-directed heart; it is not her province either to cleanse that heart or to give it power of digestion. For this she must refer her votary to a higher and holier voice, and if she ever speak of looking 'through nature to nature's God,' she does so with a humble deference to her elder sister, whose province it is to lead the heart to that contemplation. Science and religion must not be confounded; each has her several path, distinct but not hostile; each in her way is friendly to man, and where both unite they will be ever found to be his best protectors—the one 'a light to his eyes,' opening to him the mysteries of the material universe—the other 'a lamp to his feet,' leading him to the immaterial, and uncorruptable, and eternal. The 'eye,' it is true, will grow dim when the light of this world fails, and happy is he who then has 'a lamp' lighted from heaven and trimmed on earth, to guide him through the hours of darkness. But the eye must not be blamed because it is not the lamp, nor should science be disdained because she leaves us far short of just conceptions of the invisible world. Her highest flight is but to the threshold of religion; for what a celebrated writer has said of philosophy generally is equally applicable to every branch of scientific enquiry. 'In wonder all philosophy began, in wonder it all ends, and admiration fills up the interspace. But the first wonder is the offspring of ignorance, the last is the parent of adoration. The first is the birth-throe of knowledge; the last is its euthanasy and apotheosis.'"

CHAPTER V.

"The Ocean old hath my deep reverence,
And I could watch it ever—when it sleeps,
And its hushed waves but throbs at intervals
Like some fair infant's breath in sad repose;
'Tis strangely sweet to gaze—or when it starts
At voice of torturing storm, and like mad age
Tosses its hoar hair on the waving wind;
'Tis wild delight to watch it. But I love
To see it playing quietly on loose rocks,
Lifting the idle sea-weed carelessly;—
Or hear it in some dreary cavern muttering
A solitary legend of old times"——

T. H. Reynolds.

BEAUMARIS TO HOLYHEAD.

Our little Nelly is again at her old anchorage off the beautiful beach of Beaumaris, and as there is every probability that her present cruise will be a very extended one, it may be as well that I shall say a few words as to her appearance, capabilities, and accommodations. A very smart little craft is the Nelly, something between a clipper yacht and a trawler, not quite so rakish as the former, nor so heavy or clumsy looking as the latter. Her register says twenty-five tons burden, O.M., oak built, coppered, and copper fastened, A 1 at Lloyd's for an unlimited period. Old Will Hughes, her sailing-master, affirms she can glide over the smooth water like a sea-bird, or dance on the huge waves in the fierce storm like a dolphin, and, though but a tiny thing, she is as gallant, as light, trim, sure, and safe as the tall ship. These opinions are also shared by that tall, seaman-like man, Griffith Jones, mate, cook, steward, and professor of odd jobs. With the addition of Solomon Hughes, though still a boy "he is rated a man," the number of her crew is told. Blue Peter is flying at her gaff, and every preparation is made for an early departure from this delightful bay.

But, before taking our farewell of the lovely Menai, we will again ramble over some portion of its romantic shores; for many days we have been dredging the length and breadth of its stream. Passing on to the firm beach that leads to Garth Ferry, we soon arrive at clusters of small boulders and detached fragments of rocks, covered with a drapery of the coarser sea-weeds. 'Tis a lovely summer's day; the tide is gently retiring, leaving with every receding ripple its little bunch of sea-weed. Before us is the wide expanse of water—the open portion of the Strait, the old-fashioned town of Bangor, and the sombre Penrhyn Castle; above us the rocks, whose bases have for thousands of years resisted the storms of winter, and whose summits are crowned with trees, flowers, and ferns. From a rift near the bathing-house falls a clear sparkling stream, which, after wandering through woods and fields, at length leaps over the rock and loses itself in the sea. Then, high over head, the sky is of that same deep blue which we see

STAR FISH.

reflected in the waters beneath; and here and there, far aloft, are clouds of that kind which meteorologists tell us never betoken rain. Therefore, we seat ourselves on a ledge of rock and patiently wait the uncovering of our hunting ground.

Almost the first objects that strike our attention, a little below half-tide mark, are tufts of small, cylindrical tubes projecting from between the stones, wherever there is a stratum of sand and shingle of some depth above the rock. On closer examination we find, shooting from each tube, fine flaxen-like filaments, and at once recognize them as the dwellings of the *Terebella littoralis*, or Mason Worm. Stay! do not attempt to tear them up with your hand. See! they are extremely fragile, and the tube has parted just at its insertion into the firm sand, and we have only a portion of the dilapidated dwelling; the tenant has retreated into its innermost recess. To succeed in their capture, we must carefully move the sand, stones, and even portions of the rock, and trace its windings as it descends, for a foot or more, either into a fissure or under one of the firmest embedded stones, and then only we shall find the terminating orifice, and most probably those of the whole group, which may number many dozens; carefully clear away the debris, and then they can be safely removed and the ingenious architects secured. But, as this is not the only *craftsman* of the fraternity, for we have POTTERS, SHELL BINDERS and WEAVERS, each and all skilled artizans, we shall have occasion to return to them again and again, and will, for the present, content ourselves with Mr. Gosse's humourous character of this wonderfully ingenious little creature. "From the creation of the world," he states, "this humble little worm has been practising the *ancient and honourable craft of masonry*, forming his vaulted tunnels of unhewn stone—for what are atoms of sand but stone?—and binding them with *Roman cement*, which 'sets under water.' And hence I would respectfully suggest to the worthy brotherhood of free and accepted masons, whether they do not injustice in tracing their origin not farther back than Adam, since assuredly the *Terebella* were, not only brethren, but masters of the craft before he began existence—by half a day at least." As we approach nearer the lower tide mark, and where the loose stones become more abundant, we find myriads of mud-constructed tubes, frequently many hundreds in a cluster, of another beautiful Annelide, the *Sabella,* of which also there are several distinct British species. Another hour's active hunting has added a few lovely Sea Anemones to our collection of the previously named species; although extremely abundant in numbers and varieties, the distinct species, considering the geological formation of the coast and its extent, are comparatively few; and the commonest and most generally distributed of all the seventy known species, the *A. mesembryanthemum,* is here scarce and rare. At low water mark, many of the most beautiful Top Shells can be gathered, and the exquisite type of this superb family is very abundant; the *Trochus Ziziphinus,* or Purple Spotted Top, on the higher levels, particularly where there is a luxuriant growth of Fucus, and other members of the family are equally plentiful. On the opposite side of the strait, between the estuary of the river Ogwen and the harbour, are two weirs and an immense bank of sand, shell, and shingle; but it presents nothing that is worthy the attention of the naturalist beyond the vast numbers of the common cockle, *Cardium edulis,* that literally cover the entire area. Many tons are frequently gathered in a few tides, and it gives profitable employment to numerous boys and girls.

Before stepping into the boat to row to the little rock near the Suspension Bridge and opposite the steamboat jetty, let us lift that flat slimy boulder. Beneath it is a shallow pool of water. There, it is not heavy! gently! and the water will not be disturbed. But we have disturbed something that is worth looking at, and worth noting too. Not those little Shore Crabs that are scuttering out of sight, nor that angry, little, writhing Conger, nor that frantic shoal of fish. No! nor either of those apparently torpid, elegantly coloured Cross-fish, or, as the Welsh call them, five fingers, *Cribella oculata,* although the late Professor Forbes describes it in classical language. It is those vividly coloured sea-slugs clinging to the under surface of the boulder, the great Sea

Lemon, *Doris tuberculata;* the Crowned Eolis, *Eolis coronata,* and the pretty, active, little Triop, *Triopa clavigera.* We gather these, which are such truly interesting members of a very lovely family that I must endeavour to devote a special chapter to them.

Why did you remove that stone? I was about to say something of those busy fellows, the Shore Crabs and an infant Hermit that I had picked up in the old shell of a Winkle—a member of a well known and most important family, *Pagurus Bernhardus.* Well, never mind! it will give me the opportunity of presenting a pen-picture drawn by that accomplished artist, Charles Kingsley. "There are," he tells us, "animals like monkeys, and crabs which seem made to be laughed at, by those at least who possess that most indefinable of all faculties, the sense of the ridiculous. As long as man possesses muscles especially formed to enable him to laugh, we have no right to suppose—with some—that laughter is an accident of our fallen nature; or to find—with others—the primary cause of the ridiculous in the perception of unfitness or disharmony. And yet we shrink—whether rightly or wrongly we can hardly tell—from attributing a sense of the ludicrous to the Creator of those forms. It may be a weakness on our part, at least we will hope it is a reverent one, but still we can find something corresponding to what we conceive of the Divine Mind, in any class of phenomena; it is, perhaps, better not to talk about them at all, but observe a stoic '*epoché*,' waiting for more light; and yet confessing that our own laughter is uncontrollable, and therefore we hope not unworthy of us, at any strange creature and strange doing which we meet from the highest ape to the lowest polype.

"But, in the meanwhile, there are animals in which results so strange, fantastic, even seemingly horrible, are produced, that fallen man may be pardoned if he shrinks from them in disgust. That, at least, must be a consequence of our own wrong state, for everything is beautiful and perfect in its place. It may be answered, 'Yes! in its place, but its place is not yours. You had no business to look at it, and you must pay the penalty for intermeddling.'

I doubt that answer; for surely, if man have the liberty to do anything he has liberty to search out freely his heavenly Father's works; and yet every one seems to have his antipathic animal. I know one bred from his childhood to zoology by land and sea, and bold in asserting and honest in feeling that all without exception is beautiful, who cannot, after handling, and petting, and admiring, all day long every uncouth and venemous beast, avoid a paroxysm of horror at the sight of a common house spider.

"At all events, whether we were intruding or not in turning this stone, we must pay a fine for having done so; for there lies an animal as foul and monstrous to the eye as 'hydra, gorgon, or chimera dire,' and yet so wondrously fitted for its work that we needs must endure, for our own instruction, to handle and to look at it. Its name I know not, though it lurks here under every stone, and shall be glad to know it. It seems some very 'low' Ascarid or Planarian Worm. You see it? That black, slimy, knotted lump among the gravel, small enough to be taken up in a dessert spoon. Look now as it is raised and its coils drawn out. Three feet, six feet, or nine at least, and with a capability of seeming endless expansion, a slimy tape of living caoutchouc, some eighth of an inch in diameter; a dark, chocolate black, with paler longitudinal lines. Is it alive? It hangs helpless and motionless, a mere velvet string, across the hand. Ask the neighbouring Annelids and the fry of the rock fishes, or put it into a vase at home and see. It lies motionless, trailing itself among the gravel. You cannot tell where it begins or ends; it may be a dead strip of Seaweed, *Himanthalia lorea* or *Chorda filum*, or even a tarred string. So thinks a little fish who plays over and over it till he touches at last what is too surely a head. In an instant a bell-shaped, sucker mouth has fastened to his side. In another instant, from one lip, a concave double proboscis, just like a tapir's—another instance of the repetition of form—has, alas, clasped him like a finger, and now begins the struggle, but in vain.

"He is being 'played' with a fishing line such as the skill of a Wilson or Stoddart never could invent; a living line with an elasticity beyond that of the most delicate fly rod, which follows every lunge, shortening, and lengthening, slipping and twining round every piece of gravel and stem of sea-weed with a tiring drag such as no Highland wrist or step could ever bring to bear on salmon or trout. The victim is tired now, and slowly, yet dexterously, his blind assailant is feeling and shifting along his side till he reaches one end of him, and then the black lips expand, and slowly and surely the curved finger begins packing him, end foremost, down the gullet, where he sinks inch by inch till the swelling which marks his place is lost among the coils, and he is probably macerated to a pulp long before he has reached the opposite extremity of his cave of doom. Once safe down, the black murderer slowly contracts again into a knotted heap, and lies, like a boa with a stag inside him, motionless and blest." The animal is named *Nemerthès Borlasii*, or sometimes *Borlasii longissima*, in allusion to Dr. Borlase, the historian of Cornwall. It is also occasionally termed the long-worm *par excellence;* a name whose appropriateness will appear from the fact that it sometimes reaches the length of thirty feet. But we find a still more extraordinary testimony, as to its enormous length, recorded in the "Linnæn Transaction," contributed by the Rev. Hugh Doves, and includes minute details of it living, and afterwards dead:—"It being impossible while the animal was alive to make any reasonable conjecture as to the length of it, I took it out of the bottle of spirits,* and measured it after it was dead, when I found it to be full twenty-two feet long, exclusive of the proboscis, nearly twenty inches. Now, I give it as my firm opinion that I speak within bounds when I say the animal when alive might have been extended to four times the length it presented when dead. I, therefore, look at what Mr. Sowerby gives, on the authority of the fishermen at Newhaven, to be by no means improbable, viz., that this most astonishing creature may have susceptibility of being drawn out to the length of

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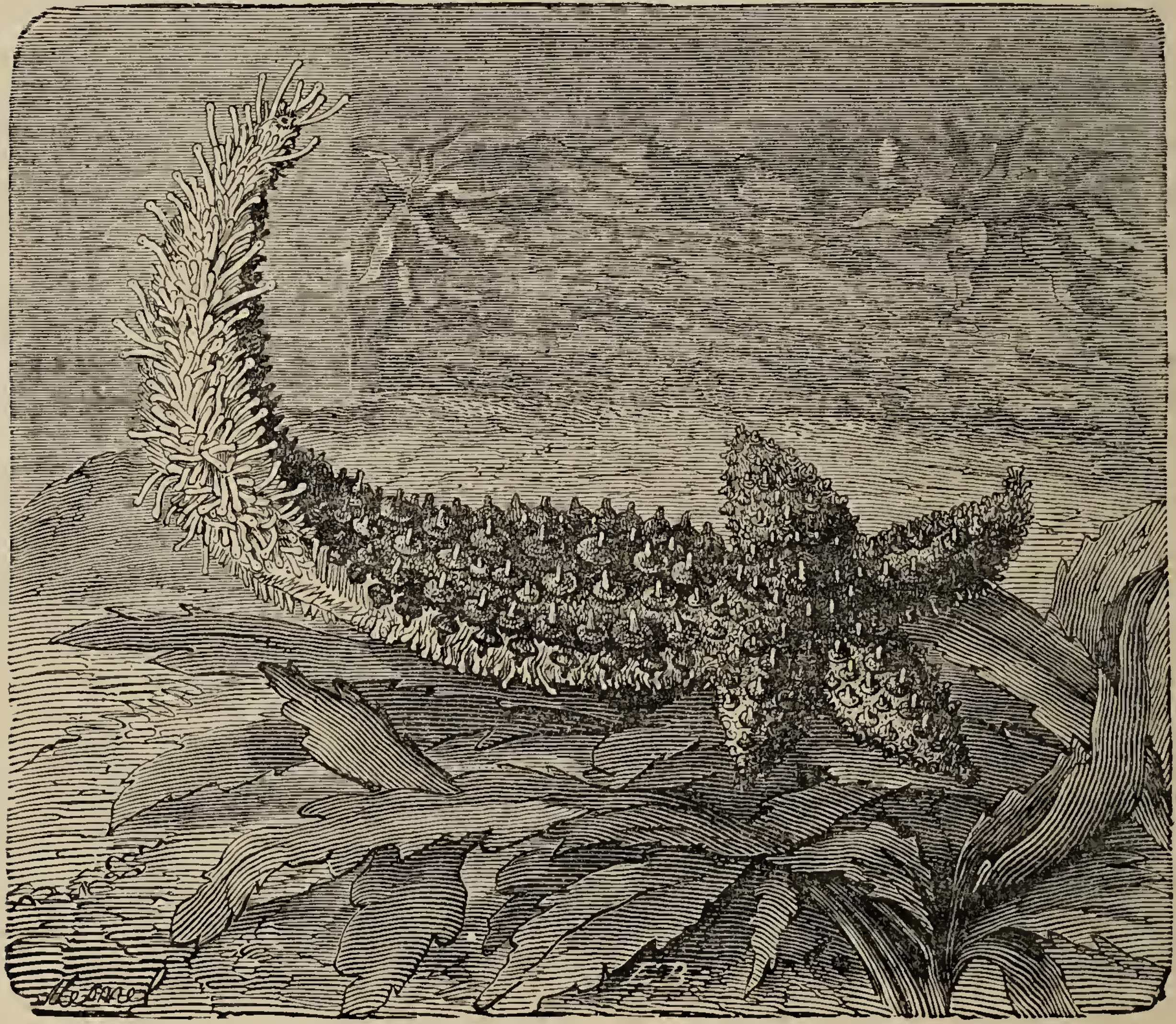
* He killed it by covering it with strong spirits—spring water would have been much better. Most marine animals die instantly when plunged into it, not even having time to contract.

twelve fathoms, or, according to the accounts of the fishermen on the south-coast of Devon, given by Montague, to *thirty yards*, or fifteen fathoms."

It is not rare on the shore near Beaumaris, and is found under stones, near low water mark, in moderate abundance. I have never seen one exceeding twenty feet. Some Parisian naturalists, who I should suppose had never travelled beyond the banks of the Seine, or witnessed the wonders of the seashore, have presumed to imagine that Kingsley had drawn on the realms of fancy for his portrait of the Long-worm. If they will only leave their closet for an hour, and turn over a few stones on this shore, they will soon satisfy themselves that there are facts stranger than fiction, and that naturalists need not deal in the ideal when the reality and truth are ever present.

We must away now, for we are anxious to reach the little rock before the turn of the tide. There is no difficulty in stepping from the boat on to a flat table-like slab at its end, bare only at low water; but the most expert climber would have some difficulty in mounting its sides, not that they are either rugged or steep, but that it is covered by thousands upon thousands of the *Mytilus rugosus*, or Rock Mussel; the dead and the alive, the empty and the full shell, forming a compact covering of great thickness. "But here they are as firmly anchored as a ship in harbour. Its foot, which is so small as to be useless for the purpose of progression, is employed in weaving silken threads of great strength, which it affixes to the rock and to its neighbour mussel, and thus mutually combined and each grasping the rock, the community of mussels live together in security." Perhaps it would be difficult to find an equal number packed in so small a space as this isolated rock presents. It is also the habitat of the common Cross-fish, *Uraster rubens*; and occasionally the Violet Cross-fish, *U. violacea*, is found in association with it, and very difficult to distinguish from the *rubens*. In the lower fissures we find dozens, appearing as if they had been stranded by the tide, dead and helpless, apparently inert masses of a coloured, fleshy substance. Their shape is the well-known cross of five rays, or points, radiating from a rounded, plump, cushion-like centre. The colour of the species is generally yellow or orange, sometimes purple or red, or a mixing and blending of these colours. They vary in size from nine inches to a foot across. Both disk and rays are reticulated, and at the angles of the reticulations arise conical blunt spines, the bases of which are surrounded by circles of thickly studded spinules. These spines, which are exceedingly numerous, form more or less the pattern of the upper surface of the rays, and extend in irregular circles round the disk. At the extremity of each ray are the eyes, surrounded by moveable spines, similar to those of the ray-spines, and the mouth is also protected by spines. The under surface of the animal is covered with suckers, cylindrical, furnished with globose



THE STAR-FISH IN THE PROCESS OF PRODUCING ITS RAYS.

extremities. The madreporiform tubercle is placed near the margin of the disk, between the origin of two of the rays. It is large, convex, and finely striate, with waved radiating striæ, which bifurcate towards the margin. The number of the rays in the common Cross-fish vary; sometimes we find six, and monstrosities have been found with seven; four is not an unfrequent number, but five is the normal number; hence the name of five fingers. Frequently it is found in a mutilated state, with one or more of the rays broken off; from these accidents it suffers no inconvenience, having the power of reproducing the rays.

"The oyster fishermen fancy that it loses its rays in consequence of its oyster-feeding propensities; that it insinuates an arm into the incautious oyster's mouth with the intention of whipping out its prey, but that sometimes the apathetic mollusc proves more than a match for its radiate enemy, and, closing on him, holds him fast by the proffered finger; then the Cross-fish, preferring amputation to captivity and dying of an oyster, like some defeated warrior, finding

> "The struggle vain, he flings his arms away,
> And safety seeks in flight."

Be this as it may, we sometimes find him more resembling a comet than a star.

"Doubtless," says Forbes, "the Cross-fish is a sworn enemy to oysters, a submarine Dando," but there is reason to believe that he destroys his prey in a very different manner from that related; and Professor Rymer Jones gives us a most graphic account of the process. No creature, he says, is more rapacious. Its prey is devoured alive whenever it can be overpowered; let a moderate sized mussel be presented, and it is straightway covered by the body of the Star-fish, while the rays closing around it, the animal sustains itself as on feet, contracting more and more as the food is gradually swallowed. If the portion of food be too large for the mouth, the stomach begins to protrude, and is appled around it."

In this way, doubtless, the Oyster, the Sea Urchin, Whelk, or any other creature it can capture, are all sacrificed to its merciless voracity.

It has hosts of enemies, but none more determined and inveterate than the fishermen, who tear them across the stomach in order to destroy them before returning them to the sea. The Admiralty court formerly inflicted penalties on those who neglected to destroy the noxious five fingers, to trample out their life; and on the south and east coasts of England large quantities are used for manure.

Now, there may be some excuse for the antipathy of the fishermen and for their use as manure, but little for their wholesale destruction as a useless pest; and I am quite of the opinion of Rymer Jones, "that a man who is fishing for his breakfast has an interest in success second only to that of the poor fisherman who fishes for his livelihood, and must frequently feel the pangs of disappointment in case of failure. Let us fancy ourselves, therefore, seated in our boat, and after a glorious pull, just half a mile out to sea, preparing for the sport; the laughing waves, sparkling in the morning sun, dance around us as we cast the heavy stone—our anchor—amidst the gently swelling waves, and, eager for the sport, prepare our lines. We feel a tugging at our hook, and, hauling up the lengthened string, expect a prize, when lo! it is but a villainous Star-fish that has seized our bait, gorging it deep and fast. Again we try, and with the same result. Bait after bait is thus devoured, till you begin to think that shoals of Cross-fishes are waiting there on purpose to annoy you. Let me see the man, hungry and tired, with every prospect of being breakfastless to boot, who keeps his temper under such a trial."

For the sake of humanity I cannot omit the following from the same excellent naturalist. "But however inimical to the fisherman, the Star fishes must always be regarded by the naturalist with unmitigated wonder, and their importance in the grand economy of creation at once acknowledged. Their appetite is for carrion. Their restless and unceasing industry is constantly employed in hunting out and swallowing all dead and tainted matters that approach the shore, which, if permitted to accumulate, would soon pollute the very ocean and convert the wave-washed beach into a charnel-house, defile the air, and render earth itself uninhabitable. All silently and quietly the work is done by these unwearying agents. Cleanliness and health attend their gentle footsteps, while to crown the whole, each, like a living granary, pours forth innumerable eggs, and thus supplies abundant food for countless hungry and expectant mouths, peopling the sea with life, and adding to the already boundless store of nature's provender."

The Violet Cross-fish is somewhat larger than the preceding, and in this locality more or less abundant. Its rays are generally from two and a half to three times as long as the disk is broad. They are broad at their origins and at about half their length taper suddenly to their extremities. The arrangement of their spines is somewhat different, being more gorgeous in colour and often very beautiful, of a bright orange or rich red with blue spots, and not uncommonly straw colour beneath.

Many of the smaller Star-fish are also found in the Menai, and one remarkably abundant, as we shall find when we reach the banks and deeper water. After an hour's ramble inland, and another long farewell gaze at this enchanting scenery, we again take to our boat, and with the tide gently glide down to the anchorage of our Nelly, for we must be up and on the wing with the morning's sun.

"Shake out that reef, please sir! Keep her full, boy. Now run her through the sound. Keep her head on for Penmon Point. Stand by to let the dredge go, Griff; we shall soon be on rare ground, sir, and show you ——"

I will not attempt to translate Old Will's nomenclature, although he is very proud of displaying it. Such a conglomeration of Welsh, English, queer Greek and Latin, I am fearful I could not render intelligible. Our course is made out, and away we go dancing merrily over the broken water, with a good, stiff breeze, passing fleets of Medusæ alternately contracting and expanding their transparent umbrella disks, and moving gracefully through the pellucid waters. The movements of the Medusæ are slow and their muscular energy very feeble, nevertheless their contraction and expansion must be incessant, for their bodies being of greater specific gravity than the water, they would inevitably sink but for this constant exertion. But still they move easily, and in the clear light their iridescent colours add a charm to their appearance. While the first gleams of the morning sun are lighting up the rugged faces of Penmaen-Mawr and Great Orme's Head, we pass the sound between the point and Puffin Island, and once again we are sailing o'er the dark blue sea :—

> "Oh! who can tell save he whose heart hath tried,
> And danced in triumph o'er the waters wide,
> The exulting sense—the pulse's madd'ning play,
> That thrills the wanderer of that trackless way?"
>
> BYRON.

Running down the edge of the bank to Red Wharf Bay, the dredge is cast overboard and sinks with a plunge; ten, fifteen, twenty fathoms of line run rapidly from the coil, thirty more are paid out and made fast. Then with a jerk that threatens its parting, it becomes taut, the vibration of the line and the rumbling sound of the dredge proclaim its working over the hard bottom. The Nelly has steadied in her wild career and is gentle in her motions. A quarter of an hour, or a few minutes more, pass. "Shall we try it, sir?" "Aye, aye!" and the stout arms of Griff. Jones, hand over hand, bring it within sight through the transparent waters. All is expectation! brilliant colours and strange mysterious forms meet our eyes. One heave and they are on deck: Whelks, beautiful Tops, Sea Urchins, Star-fish, Spider Crabs, Prawns, Shrimps, Oysters, old Shell Valves, covered with Acorn Barnacles, and the porcelain white tubes of the *Serpula triqueta*: lovely Anemones, and a host of Hermits, who are scouring away to hide themselves under every coil of rope or covered corner. Nimble fingers sort out the pretty Tops, a few Urchins, the largest Whelks, the populated shells, and a vigorous Hermit or two, and our deck is again clear. Our dredge must have contained a little colony of all ages, from the infant to the full grown adult of that busy family, the Hermit Crab, *Pagurus Bernardus;* and as we are desirous of forming a more intimate acquaintance with this well-known gentleman, or rather vagabond, and whom we shall often meet again and again under other circumstances, we have selected one of moderate size for our present purpose, who shall have our first attention. We endeavour to eject him from his citadel, the old shell of the common whelk, which he as determinedly resists, and withdraws himself into the innermost recesses of the shell, the points of his foxy brown legs only being visible. All mild efforts are vain; therefore, Master Pag., since you will not submit to gentle treatment we must adopt the same course they take with other refractory tenants, widen your door porch, and take off a portion of your roof; which task we soon accomplish with the aid of a strong pair of nippers; not heeding those curious, peering eyes of yours which seem to question our object, or those threatening forcep claws which, doubtless, would like to give us a sharp nip in return. Now, sir, we will drop you in this pan of clear sea water, in which we have placed half a dozen empty tenements for your especial accommodation. Very speedily our captive discovers the dilapidated condition of his mansion, and, as he stretches himself for some temporary relief, finds the jagged edges of the shell are anything but pleasant coming in contact with the tender parts of his abdomen, and, after exhibiting some few uneasy movements, he detects the row of empty dwellings, and at once proceeds to examine them, leaving the old shell and displaying his deformities—if they can be called such—and the cause why such protection is necessary, of which more hereafter. The first shell is evidently too small, the entrance of the second is blocked up with a pebble. Each in their turn are carefully surveyed until he arrives at one that meets his approbation. In goes one claw, then it is lifted up, turned over and over, sounded to discover any fracture, and being found all right, he quickly, with a strange movement, backs himself in; then there is a great splashing of the water, a frantic whisking of the antennæ, jerks partly in and partly out of the shell, a race round his diminutive domain, and all is at rest. We have seen that they are of various sizes, varying from the dimensions of a pea to several inches in length, and that they all occupy a shell of a suitable size. Each time they cast their coat of mail, or moult, when it becomes too tight for their increased bulk, they must also change their habitation. But this is one point which I think has never been fully ascertained. Do they invariably select a deserted shell, or dispossess the poor mollusc, the former tenant? I have repeatedly placed strong and vigorous ejected crabs into the midst of live whelks, but could never detect any attempt to molest or dislodge them; and it is quite evident they take possession of the first empty shell that offers which is more capacious than the one they are desirous of quitting, making a *flit* when it suits their convenience. It is perfectly certain they do not desire a too cumbersome and unwieldy, or a too confined habitation.

HERMIT CRAB IN HIS CELL.

It is still a question undecided whether the Hermit Crab always selects for its habitation a shell already empty, or whether it does not more frequently actually kill and devour the original inhabitant before taking possession of its outraged abode, and thus add murder to piracy. The fishermen affirm that the latter mode is the case, and the crab makes short work in ejecting the lawful tenant. We may therefore wonder that nature should have left him, as we shall see presently, so unprovided as to subject him to the necessity of feloniously appropriating the goods of another. For we shall find he would be quite as much inconvenienced by the loss of the stolen coat as the natural owner himself. But it may be said he was specially appointed to keep the shelly mollusc in check, and thus aid in maintaining the balance between the different species of the animal kingdom. Be this as it may, the peculiar formation of the *Pagurus* would confirm his charter for acting as he is supposed to do.

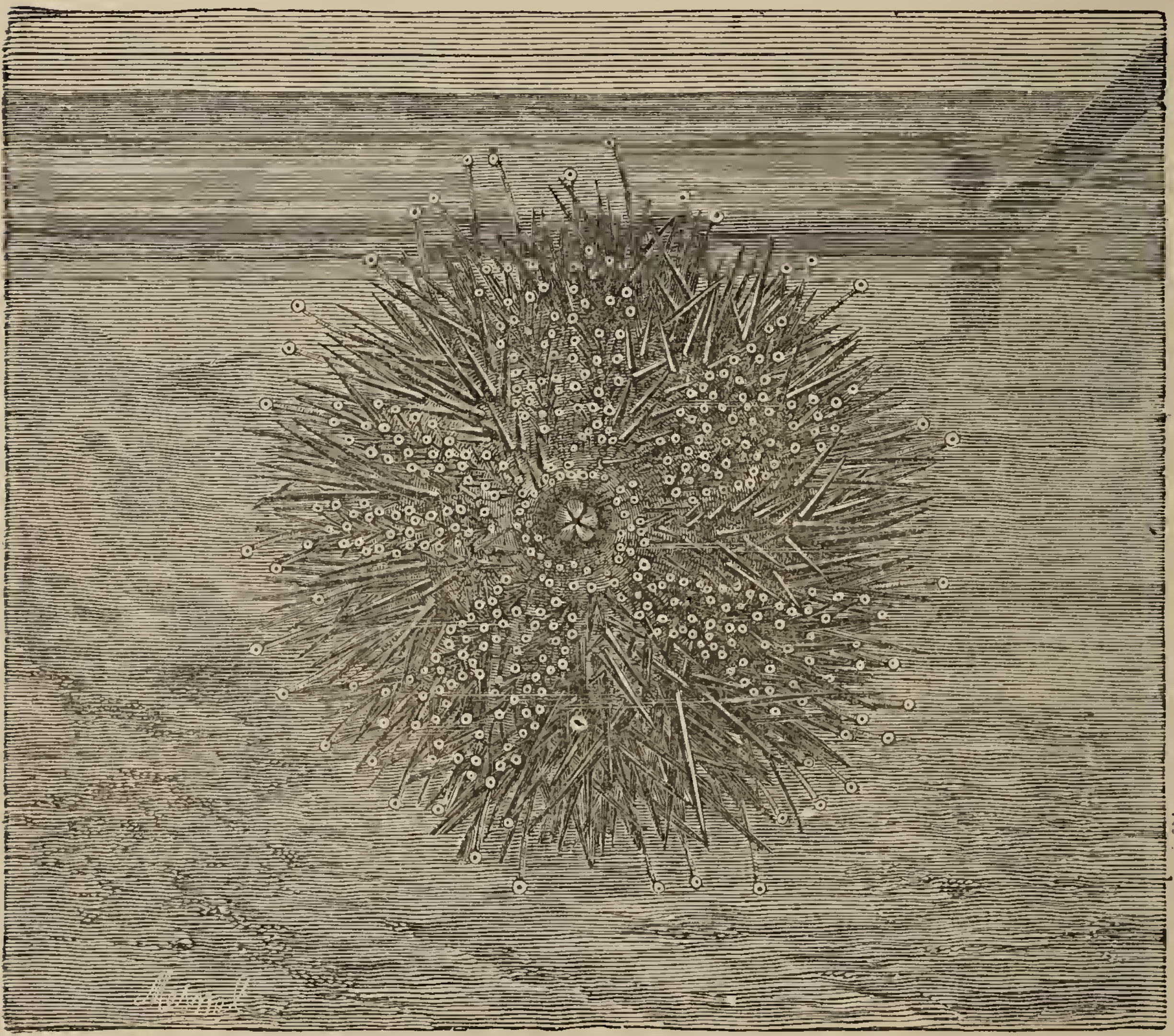
To comprehend the shape of this animal, it was necessary to deprive him of his habitation. It seems to form the intermediate link between the crab, the lobster, and other crustacea, and is, in consequence of its similarity, placed in the same order. The peculiarity of the Hermit Crab is, that although its tail is prolonged like that of the lobster, it is wholly destitute of the hard defensive covering, and by which the anterior portion of its own body is enclosed. "Surrounded as he is with many and numerous enemies, and especially by those of his own relations of the crab and lobster families, the naked and exposed condition of so essential a part of the Hermit's person would be fatal to him, as the sharp pincers of his rapacious foes would quickly deprive him of his tail; a part of his body greatly more essential to him than the caudal appendages of a terrestrial animal." It will readily be supposed, in order to adapt these shell-frequenting anchorites to occupy a domicile so foreign to the habits of their class, corresponding modifications in the structure of the animal will be rendered necessary according to the peculiarities of their form; and the wonderful adaptation of the limbs to a residence in such a dwelling, is such as to attract the attention of the most casual observer. The back part of his body, indeed, so obviously resembles one of the spiral shelled molluscs, that it required but a glance to see that the cast-off clothes of one will equally suit the other. All the forepart of the body is encased in mail like that of other crabs and needs no protection. It will be observed however, that the strong, massive claws, armed with blunt tuberculated teeth, differ remarkably in size, one being exceedingly small compared with its fellow; a provision the wisdom of which becomes at once apparent when the animal retreats into its citadel. Had the two claws been of equal size, the protecting advantages of the shell would, in part, have been useless, as it is evident the two claws could not have been withdrawn into the orifice; whereas, by the plan adopted, when the animal retires on the defensive, or conceals himself, the smaller and weaker one is entirely withdrawn, and the larger one, opening and shutting as a portcullis, thus guarding the orifice. "An instinct," it has been well said by a learned divine, the Rev. Robert Fraser, "however, is given to this otherwise helpless animal which compensates for the apparent defect of its structure. Exposed to the imminent danger of having the posterior part of its body tampered with by the unscrupulous claws of his congeners, he ensures his safety by appropriating some shell suited to his own dimensions, into the spiral chambers of which he extends his unprotected part and is at once in security; carrying about his abode with him with as much convenience as if it originally formed a part of his organization." I apprehend, however, not only from the admirably adapted size of the shell invariably selected, and its frequent freshness, the charges of murder and piracy are well sustained and rendered almost certain. To effect this nefarious purpose, the Hermit probably seizes some unsuspecting mollusc as it is grazing on the fronds of the sea-weed, and lacerating it with his powerful claws, drags it from its abode; after devouring it, he takes quiet and undisputed possession of the vacant shell. The stealthy manner in which the creature moves about would enable it easily to surprize its victim who, if possessed of any instinctive fear of such a foe, might be easily deceived by the Hermit's outward similarity to his own harmless race, a veritable "wolf in sheep's clothing." Mr. Bell, in his "History of British Crustacea," states that such is probably the fact, though he has not himself witnessed it. Thus, the Hermit Crab, while acting on its own instinct, accomplishes, along with other voracious inhabitants, the duties ordained by the Great Artificer.

"Among the many evidences of Divine foresight, the most striking and instructive, as well as beautiful, are those afforded by a combination of instinct and organization adapted to each other." The Hermit Crab is an eminent example of this kind, and affords us an admirable instance of its operation. "On the one hand, the singular instinct by which it seizes upon the shell of a species entirely different from itself is not accidental; it is not forced upon it by the notion of self-preservation in consequence of its exposed condition, but, like all instincts, is an original impulse, a tendency forming part of its condition.

"On the other hand, the structure of the uncovered portion of its body is such as to prove beyond question that it is expressly adapted to the act to which it is instinctively impelled. The tail, or hinder part of its body, is not merely capable of assuming a spiral form so as to fit itself into the chambers of the shell, but is terminated by certain hard moveable pincers, worked by a powerful muscle, whereby it can easily fix its tail in the interior of the shell, and draw itself into its retreat at will. The instinct could not have given origin to the structure, nor could the structure have originated or inspired the instinct which the little creature acts upon long before it has had experience of its danger, or of the facility its structure affords for the end in view. We must regard this adaption as a beautiful and striking evidence of the intention of Him to whose divine skill and purpose alone we can attribute at once the structure and the instinct of living beings."

Many other curious and interesting facts are connected with this numerous and strange family which the limits of this chapter will not permit us to notice. As the Cruise of the Nelly proceeds, and we have the various subjects before us, they shall have that attention they so well merit. With this slight sketch of only a few details of their characteristics, I will, for the present, dismiss them, and seek their associates.

There is scarcely a haul of the dredge but produces a dozen or more of the Purpled Topped Egg-urchin, *Echinus miliarus*, one of the smallest and, perhaps, the most beautiful of the family. We obtain them in various sizes, from a quarter of an inch to fully an inch in diameter—larger and finer specimens are rarely obtained.



SEA URCHIN CLIMBING UP THE SIDE OF AN AQUARIUM.

The usual size is about three-fourths of an inch across by three-tenths high. Its body is rose colour, with white tubercles; all the primary spines, which are often twice as long as the second series, are purple with yellow bases, and the secondaries yellow. The shell or box is not only a wonderful piece of machinery, but a beautiful object when denuded of its spines and polished. There are several British species. The common Sea Urchin grows to a large size, in some of its habitats frequently twelve inches in circumference by nearly four in height. Unlike the firm armour of the crab, which is thrown off when the increasing size of the animal renders it uncomfortable, the complicated shell of the Urchin must hold both the infant and the adult. Now, the vascular tissues are within, and the particles they deposit must be on the interior walls. This would, indeed, augment the amount of limestone in the box, but it would be at the expense of the contained space; the animal would have had less room when more room was required, and must inevitably perish if the Creative wisdom had not ordered otherwise. The box is not made in one piece. Forbes tells there are above three hundred plates of one kind and nearly as many of another, all dovetailing together with the greatest nicety and regularity, bearing on their surface above four thousand spines; each spine perfect in itself, of a complicated structure, and having a free movement in its socket. The whole of the external surface of the animal is incrusted with a fine membrane, as are also the spines, the joints of which have their flexibility greatly increased by a thick, fleshy envelope. "Truly the skill of the Great Architect of Nature is not less displayed in the construction of a Sea Urchin than in the building up of a world."

Another haul of the dredge. "Hold hard!" cries out little Sol., as it appears above water, but too late—its contents are scattered over the deck. Even to the very irons, every mesh of the net, and the rope itself is covered with the most abundant and most beautiful of our Brittle Stars, the *Ophiocoma rosula.* Doubtless it is very handsome, presenting every variety of vivid hues, arranged in beautiful and endless varying patterns. Not often do we find two specimens coloured alike. It is the most brittle of all Brittle Stars, separating itself into pieces with wonderful quickness and ease. "Touch," says Forbes, "and it flings away an arm; hold it, and in a moment not an arm remains attached to the body."

Any attempt to save a few specimens is almost useless, or indeed anything else the dredge contains. Though perfectly harmless, and displaying the most transcendent hues, every variety of shade blending and meeting, each instant changing, they are the dread and horror of all fishermen and boatmen with whom I have come in contact, and are instantly swept from the deck. What renders them so repugnant? The very thought creates a shudder. No sooner are they shaken out of the net than they begin to break themselves into fragments, with a quickness the eye cannot follow; writhing with the strangest contortions, creeping about in all directions; often flinging their arms in broken pieces around them, and with such snake-like and threatening attitudes, that we cannot resist the wish to return them into the sea. Every haul of the dredge, as we run down to Pentrath, produces exquisite and beauful shells, of which the *Trochiadæ* predominates.

Anglesey is very rich in molluscs, and we may enumerate the *T. Ziziphinus* and rare white variety, *Lyonsii*, *T. conulus*, *T. granulatus*, *T. mellegranus*, *T. Montaguii*, *T. cinerarius*, *Buccinun undatum*, *Nassa uncrassatu*, *N. reticulata*, *Venus fasciati*, *A. porrhais pas pelicani*, *Cypræa Europæa*, the *Cardinm edulis* and *Mytillis*.

Red Wharf Bay is very productive, and fine specimens of the *A. dianthus* are obtained in about five fathoms, near Point Linas, generally on old, overgrown shells of the Oyster, covered with the Surpala; the majority are the pure blue-white and salmon colour, but from deeper water a pale olive variety is obtained. Nothing can exceed the beauty of tide pools found in the blocks of limestone on Penmon and Linas Point. These pools resemble circular basins cut out of the solid stone, varying from a foot in diameter and the same in depth, to six or nine feet, bordered with tangles, on removing which are seen the most brilliant coloured Dahlias and the smaller tribes of Sea-weeds. Nothing can surpass the beauty of these Dahlias, constantly fully expanded, and frequently closely crowding the sides and the few loose stones on the floor of the basin. Merely lifting the most portable of these from the shallower basins, we obtained the rich golden column, bright crimson disked and opaque, ivory, white tentacles; others of the richest crimson, glaceous, green, and variegated, brown lilacs and greens.

There is a peculiarity connected with the *Crassicornis* taken from pools constantly filled with water. Although they instantly withdraw their tentacles, expel the water, and contract themselves, on being disturbed, into less than an eighth of their expanded size, they make no attempt to cover their warts, or suckers, with the *debris* of shells and stones, as those found above tide marks invariably do when left by the tide; and there can also be no doubt as to the character of their food, for shortly after their removal from the water, and being again plunged into it, in a few minutes they eject the carapace of Crabs, the empty shells of the Dog Winkle, and other littoral mollusc. Nothing that comes into contact with the tentacles of these voracious creatures is rejected.

Running from Point Linas to the Skerries, we keep as close in shore as practicable, occasionally shooting the dredge —with varying success—passing East, Middle, and West Mouse, and giving a peep in Bull and other little bays into which the bold coast is intersected; every creek, nook, or crevasse of which presents some interesting feature—some living creature—some no doubt rare on these rocks but equally abundant on other shores. These we pass, not being desirous of giving minute details of stragglers, or overrun the log of our NELLY, reserving them until we again find them in their metropolitan home, in their proper geographical position. Although we have not been able to add one new name to the *fauna* of Anglesey, we have found ample to interest and instruct the pure lover of Nature. "There are," as Kingsley remarks, "along every sea beach more strange things than can easily be seen in any other field of observation; and on the shore only will you have the enjoyment of finding new species, of adding your mite to the treasures of science." "But let us be content with what is within our reach, and doubt not in these wondrous and tiny creatures are mysteries more than we shall ever fathom, and hail with thankfulness every fresh book of Natural History as a fresh boon to the young, a fresh help to those who are to educate them."

The shades of evening are fast surrounding us, the sun is dipping his glory in the western horizon, for hours the bold, bluff headland of Holyhead has been looming before us. True to his word, Old Will Hughes is guiding, with careful hand, our little boat into the noble harbour, and in another hour I am comfortably seated at "mine inn," piling up bright hopes for the morrow.

CHAPTER VI.

> "Figured by hand Divine—there's not a gem
> Wrought by man's art to be compared to them;
> Soft, brilliant, tender, through the wave they glow,
> And make the moonbeam brighter where they flow."
>
> CRABBE.

HOLYHEAD.

THERE are few portions of our northern coasts that present so many advantages to the amateur naturalist, who is desirous of collecting his own specimens, rather than purchase from a dealer, as HOLYHEAD. From most of our large manufacturing inland towns, it can be reached in a few hours, a great advantage to those who have only a limited time on their hands, and can only avail themselves of one, or at most, the morning and evening tide; but even in those few hours, much may be accomplished. The island is nearly surrounded by the most romantic rocks, perforated with noble caverns, and an endless number of lovely tide-pools, teeming with every form of marine life. Of Sea Anemones, in addition to those common in the Menai, we have the Opelet, *Anthea cereus*. The Daisy is of an increased size, more various and brilliant in its colouring, as is the Olive variety of the noble Plumose. Other zoophytes, common to Anglesey, and littoral mollusca, are equally abundant. The marine botanist can also reap a rich harvest. Hundreds of the largest tide-pools are crowded with lovely specimens of Algæ. Aquarium fish, such as small grey mullet, blennies, shannys, gobies, fifteen-spined stickle back, the curious little worm-pipe fish, shrimps and prawns, can be collected in little pools and under the loose stones.

At the first hour that the tide will serve, little Sol. meets me with the punt at the pier; a case of hammers and chisels strapped to his shoulders, and abundance of collecting cans. Soon we land on the outermost point of the first ridge of rocks, and, after lifting our cockle-shell of a boat into a secure place, commence our hunt. Threading our way along the ridges of rock, and holding by the narrowest of ledges, we at last reach what may be termed a kind of platform, or a more than commonly level area. "Here they are, sir," and he makes a hasty step. In a moment he is lost to sight, having plunged into a concealed tide-pool. "Oh, Sol.! after all your experience you should have known better than that; but we know now, and must look out for these tangle covered pit-falls." But let us see what we have discovered on all sides. On every ledge of rock are myriads of the common smooth skinned Anemone, the Beadlet, of the most brilliant colours, and the closed shell-covered disks of the Dahlia. Presently we perceive long, narrow fissures between the lamina of the rocks, which are constantly filled with clear water. These are literally crammed with the *Anthea cereus*, their beautiful wax-like tentacles perfectly fringing the smooth sides and angles of the narrow little pools. The specimens are small, of the grey slate and drab varieties. After a diligent search, I concluded these are the only colours found on these rocks. Stay! pick up that little globule glistening in the sun's rays like a diamond of the finest water. It is not larger than a sparrow's egg, and exactly like it in shape. There are others in that shallow pool, going through all the gyrations and mazes of a merry dance. As you hold it in your hand it presents no semblance of life, but lies inert and motionless, having the appearance of a large bead of the purest crystal. But let us drop the little Beroë, named *Cydippe pileus* by Gosse, and *C. pomiformis* by Jones, into its native element, one of these little circular transparent pools, where the sun's rays penetrate to its lowest depths, and we shall immediately perceive it is one of the most active and beautiful creatures that beautify the lonely sea-shore. The small round or oval ball of transparent gelatine, banded with eight longitudinal lines, running from pole to pole instantly springs into life. Projecting from the body are two tendrils, which gradually, or by starts, lengthen into five or six inches, and throughout their length they are furnished with vine-like tendrils,—a fairy fishing line, with a thousand hooks, all of which it can draw up within its body when it has secured its prey. But now, as we see it darting through the water, now sinking to its extreme depth, now revolving on the transverse axis of the body, or rising gracefully and slowly like some fay's balloon, its exterior surface glistens with every shade of lovely brilliant prismatic colours. Then again, abandoning all these modes of progression, it will revolve on its longitudinal axis, holding the body vertical, and in this position twirl and twirl round and round the circle of the pool like graceful waltzers. On closer examination we discover along each curve of the meridional lines, bands of minute square movable plates, whose outer edges are set with strong cilia, like the teeth of a comb. These minute and innumerable cilia or hairs, strike the water like a set of paddles, arranged in rows, along the outside of the living machine, with a rapid, regular, and incessant motion. Never for a second do they cease to vibrate, and the rays of the sun playing along these vibrating bands, produce brilliant tints and ever changing shades of colour. "Man justly boasts his steam-boat," says Prof. Jones, "and with pride points to those paddle-wheels with which he walks upon the wave; the paddle-wheels are here more perfect far than ever were contrived by human ingenuity, for all the cumbrous engineering required by man to urge their movements, is not needed; each float, self-moving, keeping time with all the rest." The little Beroë has furnished a glowing theme for the naturalist and the poet. "Like a planet around its sun, or more exactly," says Agassiz, "like the comet with its magic tail, the little *Cydippe* moves in its element as those larger bodies revolve in space; but, unlike them, and to our admiration, it moves freely in all directions; and nothing can be more attractive than to watch such a little living comet, as it darts with its tail in undetermined ways, and revolves upon itself, unfolding and bending its appendages with equal ease and elegance; at times allowing them to float for their whole length; at times shortening them in quick contractions, and causing them to disappear suddenly; then dropping them as it were from its surface, so that they seem to fall entirely away, till lengthened to the utmost, they again follow the direction of the body to which they are attached, and with which the connexion that regulates their movements seems as mysterious as the changes are sudden and unexpected.

"At one moment the threads, when contracted, seem nodose; next the spiral elongation assumes the appearance of a straight or waving line. But it is especially in the successive appearances of the lateral fringes arising from the main thread, that the most extraordinary diversity is displayed. Not only are they stretched under all possible angles from the main stem—at times seeming perpendicular to it, or bent more or less in the same direction; and again, as if combed into one mass—but a moment afterwards every thread seems to be curling or waving, the main thread being straight or undulating; then the shorter threads will be stretched straight for some distance, and then suddenly bent at various angles upon themselves, perhaps repeating such zigzags several times; then they will become coiled up from the tip, and remain hanging like pearls, suspended by a delicate thread to the main stem; then, like a broken whip, become bent in an acute angle, with as stiff an appearance as if the whole were made up of wires; and then, to complete the wonder, a part of the length of the main thread will assume one appearance, and another part another, and, moreover, pass from one into the other in the quickest possible succession. When expanded, these threads resemble rather a delicate fabric spun with the finest spider's thread, at times brought close together in one direction without entangling; then becoming stretched apart, and preserving in this evolution the most perfect parallelism among themselves; and at no one time, and under no circumstances, confusing the fringes of the two tentacula. They may cross each other, they may be apparently entangled throughout their entire length, but let the animal suddenly contract, and all these innumerable interwoven fringes unfold, shrink, and disappear, as if made of the most elastic india rubber."

Dr. Strethill Wright observed that the surfaces of the tentacula are crowded with minute thread-cells or stinging organs, which must be regarded as instruments for the capture of prey. He states, "I had frequent opportunities of seeing these animals taking their prey by the aid of their tentacles, and was delighted with the address they displayed in using these seemingly unmanageable appendages. The food of the Cydippe was easily ascertained, as the stomachs of many of the specimens taken were packed with minute crustacea. To ascertain how the latter were captured, I threw one of them into a jar in which was a Cydippe, which had evidently not dined that day. It was instantly caught by one of the tentacles. The Acaleph at once became very animated, and performed a series of somersaults, until it had succeeded in hitching the tentacle, which held its prey, across the widely-gaping mouth, as over a pully. The tentacle was then contracted by successive jerks, until the morsel was hauled up and dropped into the stomach. This experiment was frequently repeated, with precisely the same results, by myself and friends, with the same and other specimens of the Cydippe."

If, however, the Beroës are very voracious, and devour small fry of the crustaceous brood, they in turn furnish a supply of food to the Sea Anemone and Medusæ, more powerful than themselves. "On the 12th of May," writes Mr. Patterson, "I caught a small Medusæ of the genus *Callirhoe*, and placed in the glass with it a Beroë, which had been taken at the same time. While the latter was swimming round the glass with that lively and graceful movement for which it is so remarkable, it came in contact with the filiform tentacula attached to the arms of its companion. The arms instantly closed, and the Beroë was a prisoner. I endeavoured to separate them, and for this purpose moved them about by pushing them with a camel-hair pencil, but without effect. In about an hour afterwards, when I again observed them, they were asunder, the Beroë swimming about, and the cilia of its bands vibrated as briskly as usual. It had not, however, escaped uninjured from its captor. The Callirhoë had taken from the body of the Beroë 'a huge half moon as monstrous cantle out.' In fact, the portion thus removed occasioned a vacancy which extended transversely across three of the bands, and longitudinally for about its entire length. The being which had suffered this mutilation seemed, however, quite unconscious of its misfortune, moved about in every respect as before, and for four days seemed to possess all its powers in unimpaired activity." My late lamented friend, Professor Forbes, in speaking of one of the little creatures,—the minute Medusæ, with a bright crimson spot in the centre of its disk, like a piece of cornelian encased in crystal,—says, "There is not a Medusæ in all the ocean which can match for beauty with the minute creature now before us, though its smallness is such that a split pea would overtop it; yet small though it be it has shape, colour, and substance so disposed that as yet no explorer of the sea has met with another like it. It is gorgeous enough to be the diadem of sea fairies, sufficiently graceful to be the night-cap of the tiniest and prettiest of mermaidens."

The Beroë may be kept alive for a long period in a large vessel of sea water—a medium sized propagating glass will answer best—but soon languishes in the aquarium, and melts away to nothing.

I close this brief account of my little favourite with Dr. Drummond's poem from the "Trans. Roy. Irish Acad." for 1839:—

"Now o'er the stern the fine-mesh'd net bag fling,
And from the deep the little Beroë bring:
Beneath the sunlit wave she swims, concealed
By her own brightness;—only now revealed
To sage's eye, that gazes with delight
On things invisible to human sight.
When first extracted from her native brine,
Behold a small round mass of gelatine,
Or frozen dewdrop, void of life and limb:
But round the crystal goblet let her swim
'Midst her own element; and lo! a sphere
Banded from pole to pole;—a diamond clear

Shaped as bards' fancy shapes the small balloon
To bear some sylph or fay beyond the moon.
From all her bands see lucid fringes play,
That glance and sparkle in the solar ray
With iridescent hues. Now, round and round
She wheels and twirls ; now mounts, now sinks profound.
Now see her, like the belted star of Jove,
Spin on her axis smooth, as if she strove
To win applause—a thing of conscious sense,
Quivering and thrilling with delight intense.
Long silvery cords she treasures in her sides,
By which, uncoil'd at times, she moors and rides;
From these, as hair-hooks on a fisher's line,
See feathery fibrils hang in graceful twine,
Graceful as tendrils of the mantling vine—
These, swift as angler by the fisher's lake
Projects his fly, the keen-eyed trout to take,
She shoots with rapid jerk to seize her food,
The small green creatures of crustaceous brood ;
Soon doomed herself a ruthless foe to find,
When in Actinia's arms she lies entwined.
Here prison'd by the vase's crystal bound,
Impassable as Styx's nine-fold round,
Quick she projects, as quick retracts, again,
Her fexible toils, and trusts her art in vain ;
Till languid grown, her fine machinery worn
By rapid friction, and her fringes torn,
Her full round orb wanes, lank and swift decay
Pervades her frame, till all dissolves away.
So wanes the dew conglobed on rose's bud,
So melts the ice-drop in the tepid flood :
Thus too shall many a shining orb on high,
That studs the broad pavilion of the sky—
Suns and their systems—fade, dissolve, and die."

The tide will now permit our approach to the lowest of the rugged rocks, and near where a narrow channel divides them from the main land. Fortunately it is perfectly calm,—the wind merely coming in puffs from the east,—or these groups of insulated rocks, rarely uncovered except at the most favourable tides, would be perfectly unapproachable.

Removing the leathery fronds of the tangle from the margin of a long pool, scarcely more than a foot deep, fringed with crimson and purple weed, lined with shades of lilac coralline, and shadowed with a few of the dark olive tribes, we discern various forms of animal life. At its extremity, mingling with the rich crimson fronds of the delesaria, are what appear to be the salmon-coloured blossoms of a full-blown carnation of unusually large size; but on removing the weeds we find they are members of a colony of the Plumose Anemone; and kneeling to ascertain their true position, a beautiful Purple-Spotted Top, deliberately marching, with slow but graceful movement, first over the broad fronds and then some projecting ridge of rock, appears in sight. Scarcely have we had time to remove this "thing of beauty" to our case, than our professor of odd jobs, accompanied by an elderly gentleman, pulls alongside the rock. Courteous we must be, but when intent on shore-hunting, we, in most instances, object to the companionship of any but an experienced collector. It generally interferes sadly with your freedom of action, by calling your attention to worthless objects, perhaps at some distance, which they deem of great value, while you are intently waiting an opportunity to secure a rare and long-sought variety. But the meeting with this gentleman was the exception to the rule, and in few words he made me understand the object of his visit:—"I do not wish to intrude on you," he said. "I saw in a moment your object in searching over these rocks, and having a fellow-feeling, persuaded your man to let me join you. This certainly is not the most fertile bit of garden on the Head, nor yet where the best stocked natural aquariums are to be found; but still, as we have a glorious morning, and the wind in the right quarter, we may find something worth picking up, and it is now too late to reach the Stack. Ah! I see your man understands the art and mystery of cleaving the mica-schists—he will soon secure those *Dianthus*. They are fine, but now we will remove a few of these well-worn stones, from which the weeds are springing, and perhaps we may find a shell or two, with a choice colony of Zoophytes and something else to boot." No sooner said than done; and I found I was taking a new and pleasant lesson in shore-collecting.

Scarcely more than two or three of the most lovely weed-covered stones had been removed when was seen, gradually unfolding its unwieldy body and its many convolutions, swimming by a beautiful undulating serpentine motion through the clear water, a worm, composed of hundreds of segments of great length—nearly two feet—and of brilliant and vivid colours; truly the most magnificent Nereis inhabiting our seas—the Laminated Nereis, *Phyllodoce laminosa*, or NEREIS REMEX.

"Not with your hand, boy; you cannot lift it without its parting at some of its hundred segments. We should have a light ring net; wanting that, let him escape.

> 'I would not enter on my list of friends,
> Though graced with polished manners and fine sense,
> The man who needlessly sets foot upon a worm.'"

Scarcely was the last line of the poet uttered, than Professor Griff. drew from his capacious pockets a silken, fine-meshed net, that might have been the work of fairy fingers, if not now produced by one of the little people, and the joints of an ebony fowling-piece cleaning rod, which he had ingeniously made to serve the double purpose as the occasion needed. A dexterous movement of the hand, the net then inverted into a glass jar of sea-water, and our beautiful Annelide is secured without the slightest injury. "Formerly on these rocks," remarked our kind assistant, "the Worm Pipe-fish was rather plentiful; and I have also found the larger Pipe-fish, and Deep Nose. Although not so abundant as at South Cornwall; they are often to be seen in these tide-pools at this particular season." We make a long and diligent hunt through many promising tide-pools, without meeting with either the Worm Pipe or Deep Nose; but our labour has not been profitless, for nearly all these natural aquariums yield some beautiful form of life. The smooth-worn angular sides of one are clothed with the pretty little Snowey; the deeper ones the Dahlia occupies; between the ridges are borders of exquisite Daisies; and various Nereids by dozens are populating our jars. The Daisies are perhaps the finest found on any portion of our coasts, frequently measuring two inches across the expanded flowers. Still we hunt for the smaller fry of fish, and at last, when the tide is making an encroachment on our limited space, and after turning over many loads of stones, we sweep with the net one of the larger pools, and find, writhing in its bottom, the little Worm-Pipe-fish, *Syngnathus lumbriciformis*; and in another few minutes, in an adjoining pool, was captured the finest of our species, the *S. acus;* but after all our efforts we do not succeed in securing at this time, much to the disappointment of our friend, the *S. styphle.* A few minutes more, and our morning's work is brought to a close; the tide flows in with great rapidity, after being almost stationary for more than an hour. Gathering a few univalve mollusca, we enter our boat, and after a hard pull against the shore current land at the pier, our Nelly being high and dry in the inner harbour.

A good breakfast after a long morning's rock-climbing, even in the most genial season, is welcome. Holyhead, though still an old-fashioned, irregularly built, ugly town, and not in any way improved by the tasteless modern erections, may well vaunt her hotel accommodations. They are in every respect excellent. Having a little time on my hands, allowing our captives to recover from our assaults, I wander leisurely up the sides of the hill to the Telegraph Station, where, as might be supposed, a magnificent panorama is visible. To the west, on so clear a day as the present fortunately is, the Wicklow mountains even to their very outlines, are clearly discernible. To the south, the whole range of our hunting ground, the almost level plains of Anglesey, backed up in the distance by the Alpine ranges of Snowdonia. To the north-east are the Skerries, and the elegant light tower. Just at our feet the North Stack, and its magnificent caverns. Another short but steep climb, and we are on the summit of the Holyhead mountain, and the grand and sublime scenery of the South Stack is before us. From this eminence, 709 feet above the sea level, the eye scans over the gigantic harbour works; also every indentation of this "iron-bound coast"; the precipitous face of the cliffs of the South Stack, its cobweb-like bridge connecting it with the mainland; its winding flight of steps, leading from its base to the clean white buildings and lighthouse, which add a charm to this beautiful but terrifically grand picture. Of its myriads of Sea-birds that crowd every ledge of rock, and at times seem as if to darken the very heavens, we shall say more presently. Our morning's collection next demands attention. By the time I reach the deck of the Nelly, they have been transferred to suitable vessels, and fortunately, the beautiful Nereid, *Laminosa*, had been kept in solitary confinement; no others by accident had been placed in the same jar. Out of the many collected I find but another species,—The Pearly Nereis, *N. margaritacea*, much smaller, but almost rivalling in beauty the preceeding. No matter how large the globe in which you confine the *Laminosa*, it is impossible to estimate the beauty of this glorious Annelide. The natural colour of this perfect gem of the sea is a beautiful varying emerald green, with a bluish tinge on the centre of the back, iridescent, reflecting a bright vivid blue.

"The body of these worms," Professor Rymer Jones states, "consists of a consecutive series of rings, all of which, with the exception of the anterior segments that constitute the head, seem to be repetitions of each other, only differing in size as they taper gradually towards the tail. Upon every one of these rings several external appendages are observable situated on each side of the body. The uppermost of these appendages is frequently a tuft of branching filaments of a bright red or crimson colour in the living animal; in other cases it consists of a single stem, to which lateral filaments are attached; and in some species the organs consist of mere flattened lamellæ, formed by processes of the skin; but whatever may be the shape of these appendages, their nature and office are the same; they are almost made up of the ramifications of blood vessels, and being constantly immersed in the surrounding water, the blood flowing through them is effectually exposed to the influence of the air contained therein, and respiration thus adequately provided for. These tufts, therefore, constitute so many pairs of gills or branchiæ, and from the circumstance of their being situated upon or near the back of the animal, this group of Annelidans is distinguished by the name of Dorsibranchiate.

"The other appendages to each segment are subservient to locomotion, and all called *oars*; these are generally two in number upon each side; one being situated near the back, and the other upon the ventral aspect of the body. The two pairs of oars are generally separated from each other by a wide interval, but occasionally they are so nearly approximated as not to be readily distinguishable; or there are instances in which only one pair is developed. When perfectly formed, each oar is found to consist of a strong fleshy pedicle, from which there projects an appendage called the *cirrus*, which is of very different shape in different genera. Sometimes being long filiform, at others expanded into a broad paddle, like that of a Sandwich Islanders' canoe; or occasionally it may be very small, and scarcely perceptible.

"In addition to the *cirrus*, each fleshy pedicle is furnished with a packet of stiff hairs, which can be protruded or retracted into the body at the will of the animal; these, from their expansion, add greatly to the propelling power of the oar, and moreover, sometimes constitute a most formidable apparatus of defensive weapons.

"There is not want of locomotive machinery, therefore, in one of those humble looking worms: no steamboat, with its paddle-wheels at work, presents a spectacle more admirable than that offered by every segment of the *Nereis;* and when all combine to beat the waves in unison, the ease and grace with which the creature swims, or rather glides along, almost exceeds belief."

Removing the glass pan, which contains our captives, into a favourable light, we find that for a moment he lies, abject and dejected, his head partially buried in the shingle that floors his prison, coiled up in an irregular lump. But as the bright rays of light penetrate through the glass, and a gentle motion is given to the water, he erects his head, and gradually fold by fold untwines, and the lateral paddles that are laid close over the back, spring into activity, spreading widely out to aid the animal's progress by their successive impulses on the water. Now it rapidly makes the circuit of its tank with impatient motion, as if indignant at captivity. Now in graceful undulating motions it crosses, almost doubling on itself, but still the propelling of the oars are distinct, and at the turn are seen to move with peculiar motion, as practised by the skilful oarsman in bringing his boat round. "It is a pleasant sight to see a well-manned boat glide over the smooth surface of the sea; to watch the long array of oars, as silently they simultaneously dip and rise again, all flashing in the evening sunshine; but such a sight is but a paltry spectacle compared with those afforded by these gorgeous worms; four hundred pairs of oars, instinct with life, harmoniously respond, in play so active, that the eye can scarcely trace their movements, save by the lines of iridescent splendour,—violet, and blue, and green, and gold,—the very rainbows' tint, that indicate their course."

The Pearly Nereis is also a magnificent creature, but not nearly so long as the Laminosa; it seldom exceeds eight or nine inches in length when full grown, and is divided by about a hundred and forty segments, like the preceding, provided with a complete set of locomotive organs. It is obtained by sweeping the loose sand-covered floors of the shallow tide-pools, but, being so remarkably tender, great care is required in netting them, or an entire and perfect worm out of many hundreds, is seldom obtained. That it can be broken with impunity, and each part recover the injury, and obtain new members to complete those destroyed accidentally or from experiments, has been frequently stated. It may be the case with all the favourable circumstances attending them in their proper haunts, and the pure element constantly surrounding them. But even when secured in a perfect and uninjured state, they rarely survive long in confinement, and I think the fact cannot be tested. We find not only from the experiments of the late Sir J. Graham Dalyell, that it is only the anterior portion which possess the power of regenerating lost segments, although the hidden parts retain their vitality a long time. But that careful and observant marine naturalist, Mr. Gosse, was unable to satisfy himself of this extraordinary act of regeneration. In his "Year on the Sea-shore" he says,—"I find among my notes, a record of a specimen of *Phyllodose* was sent to me from Torquay, when I lived in London; when it arrived I found that about an inch and a quarter of the anterior extremity was detached from the remainder which measured about four inches. The former was motionless, contracted, and seemed lifeless, the latter moved freely. I put both into an old aquarium. The long posterior portion glided about among the stones for two days, exactly like a living, healthy animal; the anterior part remaining motionless and contracted until the third day, when I saw it also gliding over the stones in a most lively manner, rearing its head, and feeling about in the manner of a caterpillar. Eight days after its arrival the head portion was still active and apparently healthy, but the hinder part had become motionless and was evidently dead. I find no other record of the case, and probably the anterior part died without reproduction; but the length of the period of its survival in apparent vigour, renders it not improbable that in the open sea, under the influence of abundant oxygen, and suitable food, the wanting parts might have been renewed to the fore part if not to both."

The Pearly Nereis vary in colour; those found on these rocks are nearly white, with a line down the middle of the back as described by Professor R. Jones, who truly says, "No figure can do justice to its beauty. It is quite possible, indeed, for a person to study these elegant creatures in engravings, and thus imagine that he has acquired a tolerable exact idea of their structure, without having the slightest conception of the interest which attaches to an inspection of their living forms and active evolutions."

The mechanism of these creatures, their parts, and their powers, are to be ranked among the more conspicuous and admirable works of the Creation, nor can they be contemplated without wonder.

Those who have watched the habits of the Nereids, remarks Dr. Williams, will scarcely doubt they are gifted with the power of of discriminating external objects, of making towards some point, and avoiding others. In the absence, however, of such an optical arrangement as may be fitted to collect the rays of light, it is difficult to form any conception of the nature of sight in these animals, if this endowment is really conferred upon them. Still it is not essential to the practical purposes of the lowest form of life that the objects of the external world should be *seen*, that pictures of them should be painted on the retina; it were enough that the mere presence or absence of an objective body should become evident to the sensations of the animal, by the positiveness or negativeness of the impressions received. A refinedly exalted sense of touch would suffice to accomplish this object. It is not easy for those who have never enjoyed the spectacle of the "feat of touch," performed by the tentaculated worms, adequately to estimate the extreme acuteness of the sensibility that resides at the extremities of the living threads with which the head and sides of the body are garnished. They select, reject, move towards, and recede from minute objects with all the precision of animals gifted with surest eagle sight, and steer themselves harmlessly, readily, and unerringly through the thickly entangled labyrinths of mud and stone, gravel and weed, amid the twilight of which the habitat of many of them may have been cast.

The same author observes that it is a remarkable fact in the history of the free Annelidans that scarcely any species, however organized, whether furnished or not with external locomotive organs, in its numerous and varied muscular evolutions *ever moves directly backwards*. Their movements consist always of serpentiform pranks or those of elaborate coiling. It is by the head, however, such motion is invariably initiated. The tail is always in the rear, never in the van.

Both our great historian of the Annelid, from whom my physiological information is principally gathered, and Professor R. Jones, consider one of the most interesting phenomena presented by these worms is their capability of developing and detaching progeny by a kind of sprouting from the posterior end of their bodies.

"The part where this wonderful process takes place is invariably the same: the new animal being always formed by a vegetative growth of the antepenultimate segment; that is to say, from the segment immediately preceding the terminal one. This reproductive segment may be observed at certain periods to become slightly swollen, and evidently the seat of increased vital action; and a short time is sufficient to reveal that it is employed in manufacturing a young worm, which is soon seen growing from the hinder extremity of its parent, from which, when sufficiently complete, it detaches itself. If the head or anterior segment of the species be characterized by eye-specks, antennæ, a probscis or branchiæ, these are developed in the offspring or offshoot, so as to be completely recognizable before the final separation takes place; so that we have the strange spectacle of two animals—one growing by its head from the tail of the other. Very frequently this is by no means the extent of the prodigy, for it very generally happens that as soon as the lineaments of the head of the first young one are established, the reproductive segment of the parent resumes its procreative function, and a second offspring is developed, intervening between the one first formed and the original Annelide; nay, sometimes a second and third are produced by a repetition of this process; so that four generations may be seen organically connected together and constituting one individual, which, however, soon separate from each other, and thus become converted into as many distinct animals."

The British species of Annelidans are very numerous. Some, as we have noticed, are large and free; some are exceedingly minute; some form shelly tubes in a spiral manner; others twist them in a great variety of convolutions. In others, again, the tubes are lime coloured, in others perfectly transparent; in some they are round, some wrinkled and angular. Some of the serpulæ are evidently gregarious, a large number of them occupying the same shell; on the other hand a solitary individual sole tenant of the shell. Many of the most important will be noticed during the progress of our cruise. We seek for them in the excavations of rocks, in the hollow of sponges, in univalve or bivalve shells, in the interstices of the radicles of sea weed, under stones, and in all sorts of cracks and fissures.

"There are some," says Professor Jones—as many an inhabitant of the dreary sands know to their cost—"which bury themselves in the sand or mud, where they excavate a lodge proportionate to their dimensions, and sometimes they line this dwelling with a mucous material secreted in sufficient abundance to construct a tube or sheath. From this they put forth a greater or less portion of their body, but rarely the posterior extremity, so that they may be able to re-enter on the slightest indication of danger; in this respect resembling the Sea Nymphs, whose name they bear, who when upon shore, as we are told, took up their residence in grottos—caves adorned with shells. Widely different, however, are the voracious habits of these Annelidans from those attributed to their mild and beneficent prototypes."

The following quotation needs no apology—its beauty and truth are worthy the hand that wrote it—*(Dr. Williams's Report, B. Annelida)* :—"It is not to express the pleasure which is excited in the mind of the observer of nature while contemplating the habits and manners of the Annelida. Every movement exemplifies the curve of beauty, every tentacle winds ceaselessly and rapidly through a thousand forms of matchless grace. Whether coiling round a visible object, or picking up a microscopic molecule for the construction of the cell, it exhibits a delicacy and precision of aim which the erudite finger of the most skilful artizan never equalled. The refined precision of its muscular performances is matched only by its exquisite sensibility. Like the human hand, of which the manifold movements have exhausted the admiring eloquence of philosophers and theologians, it unites in itself the most varied capacities. It is at once an eye, an ear, a nose, and a finger. It sees, it hears, it smells, it touches. Leading for the most part a subaqueous or subterranean life, the sense of sight in the Annelid is little required, and gifted in every part of the body with a superlative tenderness of touch, the sense of hearing is rendered unnecessary. Anatomy accordingly demonstrates only the obscurest rudiments of an organ of vision, while that of hearing has eluded the scrutiny of the minutest examination. It is not to be marvelled at that these humble beings should see without eyes, and smell without a nose. It is not affirmed that this is literally and entirely true, but it is exact enough to prove the wondrous manner in which sense of touch is made to supersede all other senses. Whether progressing on solid surface or through water, or tunnelling the sand, advancing or retreating in its tube, the Annelid performs muscular feats distinguished at once for their complexity and harmony. In grace of coil the little worm excels the serpent. In regularity of march, thousand-footed Nereid outrivals the centipede. The leaf-armed Phylodoce swims with greater beauty of mechanism than the fish, and the vulgar earth worm shames the mole in the exactitude and skill of its subterranean operations. Why then should 'the humble worm' have remained so long without an historian? Is the care, the wisdom, the love, the parental solicitude of the Almighty not legible in the surpassing organism, the ingenious architectures, the individual social habits, the adaptation of structure to the physical conditions of existence of these degraded beings? Do not their habitations display His care, their instinct His wisdom, their *merriment* His love, their vast specific diversities His solicitous and inscrutable providence?"

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ILFRACOMBE_NORTH DEVON.

CHAPTER VII.

"Birds of the land, ye rear your broods
In the lofty tree, or tangled woods,
Where the branch may be reft by the howling wind,
Or the prowling schoolboy seek and find;
But we roost on high on the beetling rock,
That firmly stands the hurricane's shock;
Our callow young may rest in a home
Where no shot may reach, and no footstep come.
* * * * * *
Oh! the sea-gull leads the gayest life,
While the storm fiends wage their fiercest strife."
Eliza Cook.

BIRDS OF THE SEA.

It is strange how the most trifling circumstance, the merest accident, will change the whole tenor of our thoughts, and divert them from the purpose, or the channel, we had predetermined to pursue. Fatigued, and fairly used up, in rambling over the gigantic harbour works, which have been so frequently described and illustrated that they need no record in these pages, I was sorting over some old scraps of books which my worthy host placed at my disposal, when the merest scrap of evidently an old friend met my eyes. Shades of the departed! Christopher North and James Hogg! The old snuggery of the glorious "Noctes;" time, seven o'clock; present, the ghostly forms of the Shepherd and North, not "boosing o'er the nappy," or "having some leeterary conversation," but composing an elegy on one they loved, and their own, in words more imperishable than ever inscribed on sculptured marble or monumental bronze. 'Tis but a scrap of old *Ebony* that comes in such a questionable shape, and unrolls, from the dark cells of memory, "the light of other days." If I thought these pages would preserve it from future mutilation, I would—vain hope!—I can only again print it, and then—

"The wee bit cozzie, octagon snuggery, metamorphosed, I declare, intil a perfeck paragon o' a leebrary, wi' glitterin' brass-wired rosewood shelves, through whilk the bricht bunn byeuckies glint splendid as sunbeams, yet saftened or subdued, somehow or ither, doun to a specie o' moonlicht, sic as lonely shepherd on the hill lifts up his hauns to admire, alang the fringed edges o' a fleecy mass o' clouds, when the orb is just upon the verra comin' oot again intil the blue, and the entire nicht beautifies itsell up like a leevin' being to rehail the stainless apparition!"——"Homeric!"—"Ay! Homer was a shepherd like mysell, I'se warrant him, afore he lost his een, in lieu o' whilk Apollo, the Great Shepherd o' a' the flocks o' the sky, gied him—and wasna 't a glorious recompense, sir?—for the rest o' his days, the gift o' immortal sang."—"'Tis fitted up, James, after a fancy plan of our poor dear old facete, feeling, ingenious, and most original friend—Johnny Ballantyne."

"Methinks I see him: his slight, slender figure, restless with a spirit that knew no rest; his face, so suddenly changeful, from what a stranger might have thought habitual gravity, into what his friends knew to be native there—glee, irrepressible and irresistible—the very madness of mirth, James, in which the fine ether of animal spirits seemed to respire the breath of genius, and to shed through the room or open air a contagion of cheerfulness, against which no heart was proof, however sullen, and no features could stand, however grim; but still all the company, Canters and Covenanters inclusive, relaxed and thawed into murmurs of merriment, even as the strong spring sunshine sends a singing the bleak, frozen moor streams, till all the wilderness is alive with music. I hear his voice this moment within my imagination, as distinct as if it were speaking. 'Twas exceedingly pleasant."—"It was that. Verra like Sandy's, only a hue merrier, and a few beats in the minute faster. Oh, sir! hoo he would hae enjoyed the Noctes, and hoo the Noctes would hae enjoyed him!"—"In the midst o' all our merriment, James, often has that thought come over me like a cloud." "What'n a lauch!" "Soul and heartfelt!" "Mony a strange story fell down stane dead when his tongue grew mute. Thoosands o' curious, na, unaccountable anecdotes, ceased to be the day his een were closed; for he tell't them, sir, as ye ken, wi' his een mair than his lips; and his verra hauns spak, when he snappit his forefinger and thoomb, or wi' the hail five spread out—and he had what I ca' an elegant haun o' five fingers, as maist wutty men hae—manually illustrated his soobjeck, till the words gaed off, murmuring like bees frae the tips, and then Johnny was quate again, for a minute or sae, till some ither freak o' a fancy came athwart his genie, and instantly loupt intil look, lauch, or speech—or rather a' three thegither in ane—while Sir Walter himsell keckled on his chair, and leaning wi' thae extraordinar' chowks o' his, that aften seem to me amaist as expressive as his pile o' forehead; hoo would he fix the grey illumination o' his een on his freen' Johnny, and ca' him by that familiar name, and by the sympathy o' that maist capawcious o' a' sowles, set him clean mad—right doon wudd a' thegither—till really, sir, he got untholeably divertin', and folk compleen'd o' pains in their sides, and sat wi' tears rinnin' doon their cheeks, prayin' him for gudeness to haud his tongue, for that gin he did na, somebody or ither wad be fa'in' doon in a fit, and be carried oot dead."

"A truce, my dear James, to all such dreams. Yet pleasant, though mournful, to the soul is the memory of joys that are past! And never, methinks, do we feel the touch of that beautiful sentiment more tenderly, than when it dimly passeth before our eyes along the mirror of imagination; for I agree with thee, thou sagest of shepherds, that when the heart is finely touched by some emotion from the past, the mirror of imagination and of memory is one and the same, held up, as if in the moonlight, by the hands of love or friendship; never feel we the truth of that beautiful sentiment more tenderly, I repeat, James, than when we suddenly re-behold there the image—the shadow of some face that when alive wore a smile of perpetual sunshine—somewhat saddened now, though cheerful still, in the momentary vision—and then as we continue to gaze upon it, undergoing sad obscuration, and soon disappearing in total eclipse."

Why these digressions? Pardon them, dear reader. It is pleasant, but mournful, to the soul the memory of joys that are past. 'Tis pleasant to look upon the shades of those glorious men who shed many a bright gleam of sunshine to ripen and cheer the weak and timid aspirations of our youthful days :—

> "The world might laugh were I to tell
> What most my old age cheers—
> Mem'ries of stars and crescent moons,
> Of nutting strolls through autumn noons,
> Rainbows 'mong April tears ;
> But chief, to live that hour again
> When first I stood on sea-beach old,
> First heard the voice, first saw out-rolled,
> The glory of the main;—
> Many rich draughts hath memory,
> The soul's cupbearer, brought to me."
>
> ALEX. SMITH.

In such an hour as this the memories of the past come most vividly before us. Our childhood, schoolboy days, the companions of our youth and manhood, the sharers of our joys and toils, our anticipations of the future, the strange hope, or still stranger dreams and imaginings; the stern reality all the while present, but dimly revealing its import and responsibility. "Memory never wakens but with imagination; then she can give us back the perished ones, even in the loveliest looks they wore; at the touch of her magic wand time and distance melt into nothingness, and rolling away the stone from the sepulchre, she summons back from death's dateless night, shadows of the loved." And if bright stars have illumined the dark walls of modern Athens, that for all time have sunk below the horizon, and are seen no more, has not our modern Babylon had her glorious constellations? Within the purlieus of Fleet street many a dark and dismal night has been rendered refulgent with light from bright and beaming suns, who, alas! have also passed into the dark shadows of the grave; but, though gone to that last bourne, their glory is not obscured. Shades of Becket, Thackeray, Jerrold, Reid, Doyle, Leech, I hail you! E'en while I write your names, your friend, your chief, who—with a loving kindness, a gentle hand, a wise discretion, ever alive and true to all that renders friendship and honour dear to man—governed your councils and deprived of its venom the powerful weapon entrusted, for weal or woe, in your hands. He, too, has passed away in the zenith of his glory. And scarcely had the cold sod closed o'er his grave than another, whose song on a Christmas Eve cheered the weary heart at the cottage hearth, sent joy and gladness into our English homes, and many distant lands; who painted in the dark hour of trouble the bright gleams of hope in the future, often rendered cheerful the hours of sorrow and depression, and who taught us to value and respect the nobility of the poor, the patience, honour, and endurance of the oppressed—CHARLES DICKENS! As I write thy name my page becomes obscure.

"Fare thee well then. Time may bring us
  Other friends—but none like thee,
Who in thy peculiar beauty
  Wert, what we no more shall see:
From our ears seraphic music
  In thy voice hath led away;
From our eyes a glorious vision
  Passed, to mingle in the clay!"

Could memory take us back a period of less than a century, we should find natural history was hardly worthy of men of practical common sense. But within the last few years, a band of noble men, brave as the crusaders of old, in the midst of contempt and scorn, stepped forth, and endeavoured to withdraw the dark curtain that obscured some of the noblest works of the Creator. For it is not alone that such names as Ellis, Montague, Thompson, Sedgwick, Lyell, Jamieson, Johnston, Gosse, and poor Edward Forbes, illuminate and adorn the pages of the past and the present; but following in their footsteps have been a humble but glorious band of workers, self-taught men, aye and women too, drawn from the lowest ranks of life. Well may Charles Kingsley say, "There were excuses for the old contempt of the study of natural history." I also have said enough, it may be hoped, to show that contempt to be now ill-founded. Doubtless still there are those who regard it as a mere amusement and somewhat effeminate, and think it can, at best, only help to while away a leisure hour harmlessly, and perhaps usefully, as a substitute for coarser sports or the reading of novels. "Those who have followed it out, especially on the sea shore, know better." It may well be said, what a change of temper has taken place in the last two generations, even in our own days. A very few years since, if you saw any of the sons of toil, snatching from their rest the few minutes they could devote to science, and returning to their homes with their napless hats covered with the fruits of their collections, you would have heard them derided as buzzard hunters, and looked upon as idle do-nothings, or a band of poachers. But the village naturalist, botanist, and geologist—and their name is legion—are now the honoured men of the community. No longer the idle dreamer, the trespasser on other men's lands, but, wherever their object is known, they are the ever welcome visitors. On all hands, no matter what their position in life may be, whether prince or peasant, they are no longer met with scorn and contumely, but honoured as those endeavouring to do good. The brief span of life is not sufficient to exhaust a subject of such vast extent.

It should never be forgotten that, in thus seeking to read the deep things of the creation, we are studying the handywork of that supreme Being who is "so wonderful in counsel and excellent in working. The marvels the depths of ocean reveal to us, are but a faint reflex of the higher marvels of the mind. The divine Architect designed his own creation and found his own materials."

I may congratulate myself that with the scrap of the "Noctes" there were other scattered leaves of the same number of Blackwood, with the almost obliterated date, February, 1831, and a portion of a short article, "South Stack."

Forty years have elapsed since it was written, "a monstrous cantle cut out of a man's lifetime" the Shepherd would have said. But it is still as fresh as the young green tree. We will turn to the South Stack, which forms a prominent feature in the bold, romantic scenery of this portion of the coast, and combines so many objects worthy of notice, that be the observer what he may—poet, philosopher, mechanist, or naturalist—he will find wherewithal to excite his curiosity and reward his labour in visiting a spot which has not many rivals; and of whose history I am not aware there is any other chronicle than the almost now forgotten one before me, and of which I regret my space will permit only a few short extracts. Those who, within the last few years, have quitted the Irish coast at nightfall for Holyhead may have remarked, after a progress of a few miles, as they paced the deck, a speck of light glimmering in the east on the very verge of the horizon, now dipping below it, now emerging above it, as the vessel, breasting her way, rises or falls upon the wave. On a nearer approach they will perceive that this apparently insignificant star slowly and regularly assumes the form and brilliancy of the brightest planet, and then receding and dying away, as if gradually absorbed in the surrounding darkness. The traveller by day, on the other hand, who in his passage up or down the channel nears the eastern shore, must have observed a white tower, posted like a sentinel on the brow of a low hummock, apparently forming a projecting ledge from the seaward base of *Caer Gybi*, or the mountain of Holyhead. On approaching still nearer, he will perceive that this hummock is, in fact, an island torn from the main mass, but connected therewith by a link, at a distance resembling the gauze work of a gossamer, which in its fall had accidentally caught upon the projections of the disjointed rocks.

Let him look a little longer, and he will now and then detect minute objects passing to and fro, and come to the obvious conclusion that this aerial pathway is neither more nor less than a connecting ladder of accommodation formed by the hand of man. The speck by night and the tower by day, with its hummock and fairy bridge, comprise what is called the SOUTH STACK, whose most remarkable features will form the principal subject of this chapter.

It is a great advantage to meet with an intelligent friend who is perfectly acquainted with the locality you wish to investigate, and more especially if his tastes and pursuits approach or amalgamate with your own. It saves endless trouble and time in reconnoitering. At best, the opportunities for effectual shore hunting are few; for days, nay weeks, you may have to wait for favourable winds and tides, and wander about the coast listlessly hoping for opportunities that may never occur. It is also an advantage if you can pick up even an imperfect scrap of history of a little known coast or island, so as to guide you to those points that are best worth your observation. Without these, and other aids, of which I will say more presently, you are working as it were blindfold ; you know, and feel assured, from the geological formation of the coast, the creatures you seek, and the scenes you wish to explore are there, but you know not how to approach them.

From the summit of the South Stack, in the midst of myriads of Sea Birds, from the lantern of the noble beacon, aided by the light-keepers' information and their telescopes, we have made a reconnoissance of this wonderful bit of sea-coast. Wind and tide being both favourable, we make arrangements with some experienced local boatmen for a few days' assistance. And I must in justice state, in contra-distinction to the apathy with which every class of fishermen have been charged by many naturalists, the boatmen of Holyhead and the Menai are, not only intelligent, but willing and effective assistants, making their labour a pleasure, I may almost say "a labour of love." This tribute I owe to the many favours I have received at their hands. Their charges may be considered high, in some instances exorbitant, but, at the best, their livelihood is very precarious.

Two hours before low water, near where the noble arch of Anglesey marble marks the footsteps of royalty, we step on board a powerful, heavy boat—light gigs or skiffs are out of the question, and would be perfectly useless. Everything has been prepared for our short cruise, and the gleeful faces of stout Griff, and Solomon the wise greet our arrival. It is a glorious pull on a bright sunny morning, with a gentle summer breeze across the mouth of the new harbour, giving the long-armed breakwater a wide berth, down to *Enys-y-welt.* A narrow, whirling channel divides this rugged island from the mainland, and just at its entrance, not half a cable's length from this dangerous-looking gorge, the imperative voice of the master boatman cries out, "Sit quite still, please, gentlemen, and hold fast, and I will land you in that creek." Creek! nothing was to be seen but a yawning rent in the rock, bristling with points, standing from its sides, like shark's teeth. But in a moment, clear of all, shooting the whirling channel, the boat is safe in a little, narrow tidal basin, that might have been constructed for our special accommodation, but it bore no evidence of the work of human hands.

Rock-climbing we know, at the best, is not one of the most agreeable modes of locomotion, and doubtless there are many pleasanter paths than the rugged sides of *Enys-y-welt* present below tide marks. "Only another ridge or two, and we shall reach our destination," are the cheering words of my friend; and then after another up-and-down struggle, and many an ugly tumble, we at last reach a desolate spot of rocks and broken fragments, slippery with their drapery of the coarser sea-weeds. Removing these, lovely tide-pools are revealed, and I may record, planted with gorgeous living Dahlias, superb Daisies, noble Plumose, dazzling white Snoweys, crowds of small, dove-coloured Opelets; the shallower pools and rock brilliant with the deep crimson blossoms of the Beadlet. The common limpet, *Patella vulgata*, flourishes here, and grows to an unusually large size on the lower ridges. Every stone is covered with the cannibal Dog Whelk. Four species of the beautiful Tops were collected within the space of a few yards; Crabs, so abundant, evidently of several species, that it was useless to even note them. These little rock pools teem with the choicest of Aquarium fish and lonely Algæ. So far we have added nothing to our previous knowledge of Anglesey's fauna, and after one more search will, for a moment, glance at its geology and ornithology. A few yards farther, and we pounce on a colony of the pretty oyster-catching Gulls, *Hæmatopus ostralegus*, and turning a sharp angle rouse from his banquet a Green Shag Cormorant, *Phalacrocorax cristatus*, with a half-gorged conger in his gullet, and the struggle between the writhing eel and the bird becomes exciting, as he flaps his heavy wings to an opposite point, to finish his meal in peace, and far from further interruption.

GREEN SHAG CORMORANT.

Again we take our boat; "the shore is silent, now the tide far out." For a short distance beyond this island the scenery is tame and insipid. As we advance, however, the rocks assume a bolder and more precipitous front, and in a few minutes, where the small insulated rock, called the North Stack, detaches itself, a magnificent picture appears through the fissure. From this point may be said to commence a panorama of splendid scenery, continuing without intermission or diminution for the remainder of the day's cruise. And here we will pick up the narative of the contributor to old *Ebony* :—

"As in the case of Enys-y-welt, there is a passage between the rock and the main, but so narrow, that unless the water is perfectly smooth, an inexperienced navigator might hesitate to attempt it, even in a boat; yet through this channel, flanked by bristling rocks projecting from its sides, it is recorded a large cutter passed in a heavy sea. The event took place some fifty or sixty years ago, but the particulars are fresh in the memories of many still living (1830). She was one of the post office packets, conveying the mail from Dublin to Holyhead. The wind was blowing tremendously, and a thick mist had for a time concealed the land. At a moment of extreme anxiety—the captain being well aware of his proximity to the coast—it cleared up, revealing as fearful a situation as any in which mortal man could well be placed. An overpowering sea, rolling before the gale, was hurrying the vessel onwards to a fate which seemed inevitable, imprisoned as she was now discovered to be in a sort of bay of precipices, lashed by a shower of foam, bursting not only at their bases, but breaking over the ledge of rocks, which here and there raised themselves above the swell. Letting go an anchor would have been useless; had it held the ground the strongest tackle must have instantly yielded before the pressure of such a sea. To beat out was equally hopeless, for the North Stack projected so far into the offing as to afford no chance whatever of weathering it. At this awful and critical juncture an experienced sailor stepped forward, and urged the possibility of escape. 'It is high water,' said he to the captain, 'but there is a channel between this land and the main, and I think we can push her through,'—hidden as it was behind the rocks of the Stack, over which the waves were frightfully breaking. To hesitate was death, the forlorn hope was decided upon, and with that ready confidence so peculiar to British seamen in the hour of peril, the order was given, 'Up with the helm; haul taut the sheets;' and away luffing to the wind the bounding vessel flew towards the terrific chasm, on which every eye was riveted. Had the helmsman relaxed in nerve but an iota; had the swell interrupted the action of the tiller, though but for an instant; had she swerved but a foot from her course, her planking must have been rifted from her ribs by the grim range of serrated rocks, on which a biscuit might have been thrown with ease, as she floundered through the foam, and shot by them like an arrow from a bow. For a minute their fate hung upon a hair; in another they were in safety, and within an hour firmly moored in the harbour."

On passing through this narrow channel, the eye rests on pile upon pile of stupendous rocks; the lower range broken into fissures, forming natural vaults and caverns of the most magnificent and picturesque description. Immediately on the left, one called Ogo Vaur perforates the base of the headland, which can be fully explored at little less than half ebb. A landing is easily effected on a rough shingly beach, mingled with larger fragments of rock and boulders, which partially block up the entrance to the cave or rather tunnel. To an experienced shore hunter these natural vaults present no insurmountable obstacles, but the entry of them should never be attempted without the assistance of those perfectly acquainted with their peculiar character. Nothing can surpass the beauty and abundance of the gloom-loving zoophytes, the walls and floors are covered with the most magnificent specimens. Plumose, of enormous size, are hanging from every projection, and nearly every fissure and crevice reveal some exquisite specimen. Under the masses of rock and boulders, springing from between the pebbles, are every variety of Actinia common to the coast. With some little trouble, and many slips, we have penetrated far into the gloomy interior of this famous Ogo Vaur. Looking seaward, through the portal, a suitable frame-work to as fine a marine view as can be imagined; the perforation is perfect, the picture is charming, and worthy the artist's pencil. Not far from this noble cave is another, called the Parliament House, of still greater extent, and in comparison with the lower house of Saint Stephens, is as Saint Paul's to a village church.

"If it is the breeding season," writes the contributor to "Blackwood," "let a gun be fired on entering, and mark the effect; for lo! from every chink, and crevice, and chasm, as if shovelled out or exploded from a cask—for I know not by what apter comparison I can convey an idea of the effect—down tumble shower upon shower, and pack upon pack of Guillemots and Razor-bills, their snow-white breasts and dark violet backs forming a beautiful contrast with the background gloom, as they dart through the aperture; while above and below Gulls glide or hover, screaming and wailing at this ill-timed intrusion on their privacy. Here the empire of the birds commences, and is continued with little interruption, though with singular selection and variety, for a considerable distance along the more inaccessible heights of the coast. The claimants for this undivided possession of the empire of air and water are divided into four classes, who occasionally contest the possession of certain spots and allotments." "Of these the most numerous are the Gulls and Guillemots, with their congeners the Razor-bills; but of these I shall speak more at large when we set foot on their favourite haunts in the South Stack, merely noticing them at present as forming a conspicuous feature in this part of the scenery, dotting in fixed or moveable patches the rocks, the sky, or the sea, according to their immediate occupation of nursing, flying, or feeding. Though fewer in number, the most attractive and characteristic, perhaps, are the gloomy ominous forms of the Shags and Cormorants, and the stately, grave, and sedate figures of the Herons."

One of the most singular circumstances—and we find it precisely the same on every rocky coast, from the Shetlands to the Land's End—connected with this associated location is the absolute line of demarcation and boundary observed on all sides; each species taking a separate site, and never intruding on the appropriated districts of a neighbour. The Guillemots and Razor-bills nestle, for the most part, in their holes and corners; the Gulls are scattered, with rather more latitudinarian spirit, over the whole surface; while the Cormorants usually sojourn on a somewhat lower range, as if more suitable to their heavy, awkward flight. But most select and ascetic, as far as communication with others is concerned, are the Herons. Simon Stylites, on his column, could not have more effectually secluded himself from the world than one of these long-legged birds upon his solitary ledge.

We will now, for a few minutes, pass to the geology of these strange islets, and again return to our sea birds. The whole coast consists, more or less, of a micaceous schistous character, traversed here and there, as may be seen about three miles eastward of the South Stack, by a vein of trap, in itself sufficient indication that indirect igneous, if not immediate volcanic, causes have been no slumbering agents in the formation of this range of coast. Of its having been upheaved, or severely compressed by some adequate force, from an original position on the earth's crust, a glance upon the precipice fronting the island affords indisputable proof; and that a great portion of this stratification was at one period in a semifluid, or pliant state, must be admitted to be equally unquestionable. I can nowhere recollect such a series of fantastic festoonings and twistings as the face of the rock presents. A few yards on the right of the mainland gateway, opening upon the suspension bridge, I can compare it to nothing more analogous than rolls of ribbon uniformly plaited, resting on an uneven foundation. A little farther on the other hand, the rock changes, not only its integral character, but its stratification, assuming instead of the horizontal a perpendicular form, exhibiting finer and bolder, though perhaps less curious, features than its intimate neighbour, on which it immediately rests. Thus the Parliament house cavern seems to have been formed by the falling of fragments, disturbed and disjointed by a sudden change from the horizontal to a perpendicular stratification, when at the period of its rising it forced aside the more yielding masses of the tortuous schist. An additional proof that this obdurate mass was the agressor may, I think, be inferred from the shattered surface forming the peak of the mountain rising far above the surrounding and more decidedly micaceous schistous beds, exhibiting a dismal scene of fracture and dislocation, as if the cumulus had contended with sturdy obstacles in its process of elevation. An experienced observer will require no directions to detect various points of contact between rival masses, but there is one within a few yards of the spot on which he first treads upon the island after crossing the bridge, so well adapted for observation, that it may be allowable to point it out. On proceeding towards the light-house, he will perceive a deep indenture, very conspicuous on the east side, where the sea rolls in, forming a gulf, of which I shall say more presently, into which a natural tunnel opens, proceeding to the extremity of the promontory. Immediately fronting the abrupt face of the opposite side of this gulf he will trace a marked difference in the texture of the arm on which he stands and that directly facing him; the one being in part more massive, while the other inclines to the micaceous schistous form—and on following the two curves of the gulf to their point of junction, he will readily remark that although in contact they are nevertheless not identical. The same strata, and possibly the intermediate chasm, may have been occasioned by the rupture which took place in their component parts at the moment—and if it was the work of a moment, what a moment! of collision—when these mighty rocks rose from the sea, grinding and grating one against the other. The North and the South Stacks form the two flanks of a rugged and interesting amphitheatre, extending from point to point rather more than a mile; and it is principally to these two island rocks, and the intercepting coast, that the above remarks refer. A glimpse or two may be caught of the South Stack before rounding the northern point, but it is not until we are fairly in the bay that it stands out in all its details. If seen after the sun has passed the meridian, and therefore long after the eastern rays are withdrawn, the island presents a sombre hue, its dingy uniformity broken only by the indented irregularities of its surface; whereas the mainland, either from being somewhat less assailable by the sea, or from being more exposed to the air and sun, and also to the operations which were for years employed in forming the communication, presents a variety of shades, in which, however, a dull red is predominant. On a nearer approach every part assumes more importance and interest.

On the left of the headland precipices rise abruptly from the water's edge. In front the light and airy bridge springs from rock to rock, while on the right a dark, deep cavern forms the aperture of another natural tunnel, similar to that of Ogo Vaur, penetrating through the north-east side, and curving in a south-easterly direction, where it opens into the little gulf previously mentioned, the sea rolling through it at all times of the tide.

It is at the mouth of this cavern, along side a shelving rock, we bring our boat, and effect a landing. By means of a rude flight of steps to a certain point, a tolerably commodious and easy ascent is practicable to the summit level of the island, near the spot on which the suspension bridge terminates.

Thus much for the geological and topographical attractions. As for the naturalist, the scene, as it appeared forty years ago in all its feathery glory, we will now give the testimony of a close observer and eloquent eye-witness; premising that at the present day the facts exist, with this important addition—for hundreds read thousands. Many circumstances have favoured this enormous increase at this one particular spot, the birds are strictly cared for, and not, I much regret, elsewhere. A system of almost extermination, I may say, has for years been going on, over a wide extent of coast, to supply the demands of fashion. Could our fair friends see the sands strewn, as is very frequently the case, even in a small and neighbouring island, with the mutilated carcases of dead and dying sea-birds—for a blood-stained wing or breast is useless as a commercial article, therefore the wounded are left to perish as they may—the fashion would soon cease, and no longer be the cause of such heartless cruelty.*

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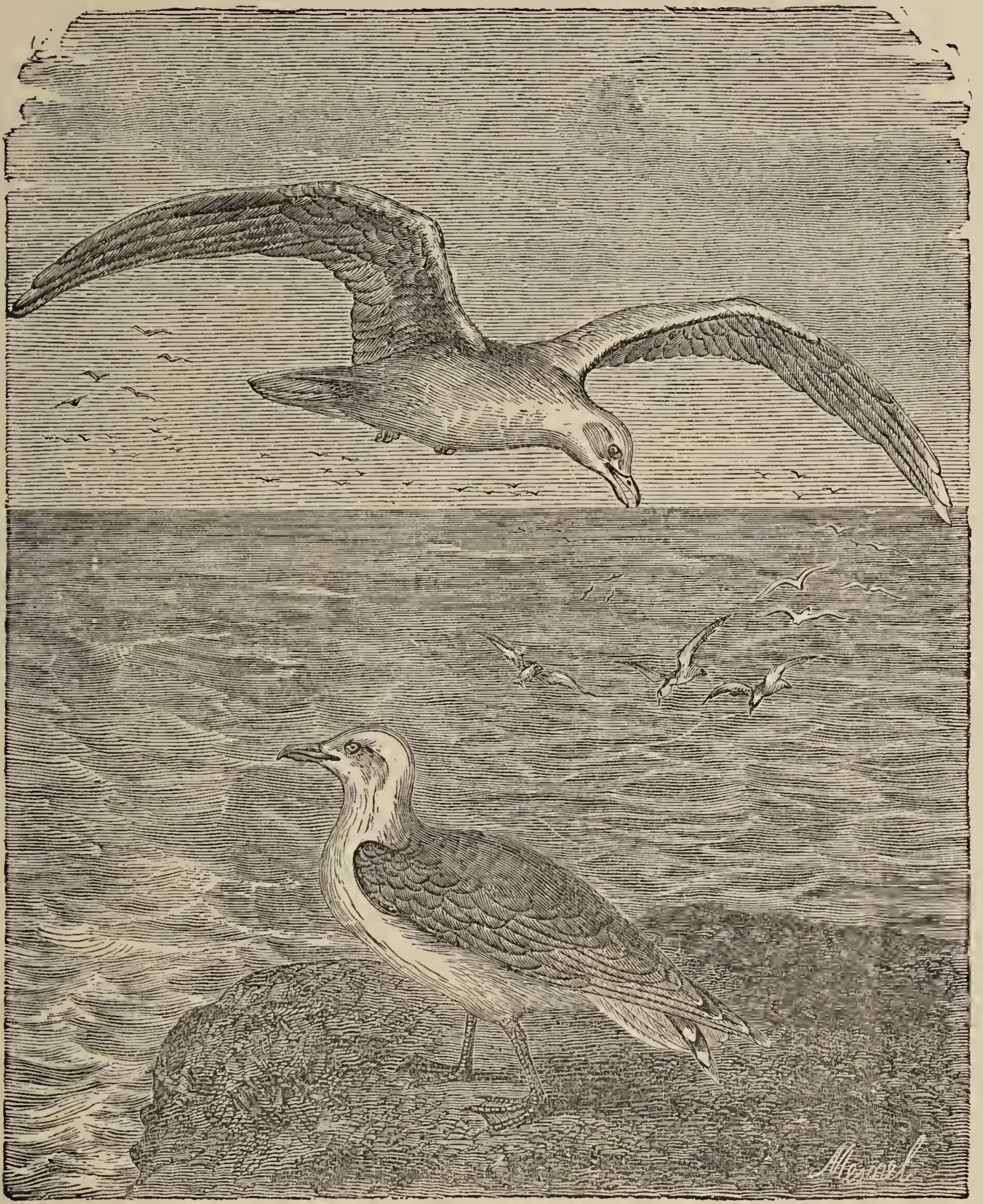
* Since writing the above, a law has been passed to prohibit the killing of these birds.

But happy are the sea-birds of the Stacks. Their careful guardians, the light-keepers, will allow no deadly weapon to assail them, or pilfering fowler to rob their nests. Even the Stormy Petrel skims the waves unharmed. We will return to the North Stack. "Having left the caverns," says our author, "some distance, a perpendicular wall of rock presents itself, of which the Herons



SEA GULLS.

have taken exclusive possession, reminding me, from the peculiar positions of their nests, of the hermits of Montocvrat, who, by a refinement on solitude and stretch of self-denying ingenuity, have so contrived their dwellings that the door of one may be placed within a few yards of another without the possibility of the tenants holding the slightest converse or communication. Thus, if a square foot of insulated space can be found, there one of these staid and melancholy birds is sure to be found, posted like a warder on a watch tower, motionless. Grey as the rock itself, he might be mistaken for a piece of sculpture but for the harsh cry, ever and anon uttered, or by his now and then drawing back his neck and burying his head between his shoulders; and then, stretching out his long legs far behind, in lieu of a tail, to act as a rudder, he launches himself silently from his resting-place and floats away slowly, flapping his wide-spreading pair of wings. A colony of about twenty or thirty appear to have monopolised this dreary façade, and year after year, at the appointed time, their rude eyries are refitted for the reception and perpetuation of this lonely tribe."

Allowing our boat to drop slowly along the front of this interesting amphitheatre, we pass advanced detachments of Guillemots and Razor-bills crowding the highest narrow ledges of the perpendicular face of the rock, and the white breasted Gulls protruding their heads from every little chink and cranny. These increase vastly in numbers until we reach the main body of the assembly on the sides of the South Stack. Arriving at our former landing place again, and step by step mounting the hundreds of rugged stairs, we reach the point where a promontory juts out from the island. From this elevated position, and nowhere else, can the birds be contemplated with ease and satisfaction. "There I have sat," says our author, "and could have remained for hours, watching these sea birds, and listening to their wild cry mingling with the hoarse roar of the waves lashing the rocks below." 'Tis a delightful view seaward from this little spot, a point as it were betwen sea and sky. In the distance the noble ship, the mail steamer, making for the harbour, and our little Nelly, close inland, trawling over the banks for a dinner or what else ocean depths will yield. But to return to our ornithological observations. The perpendicular faces of the rock, dipping to the little gulf, are intersected by innumerable fissures, ledges, and shelves adapted admirable for birds requiring these accommodations; and here, accordingly, an army of Razorbills and Guillemots have taken up their position, almost, though not entirely, to the exclusion of the Gulls. And therein, as if conscious of their safety, it being as I have said an invariable rule never to disturb them, they were carrying on their usual occupations with the most perfect unconcern, permitting one to enter fully into their domestic arrangements. "Closely jammed in a lateral niche, just opposite, sat along and numerous row of Guillemots, all bowing their heads at each other with a gravity and solemnity unaccountable. On they went, for above a quarter of an hour, without intermission, each nodding slowly to his neighbour, who, with equal composure, nodded as slowly in return. Now and then, from another ledge, one or two would come in from a short excursion, and jostling the whole line, send a dozen or two backwards over the edge, croaking disapprobation at the intruders, who took the vacant places utterly disregarding the confusion they caused. It was impossible, at first, to divest one's self of an involuntary shudder as they slided headlong or backwards into the abyss, their squat plump bodies supported by such comparatively disproportionate wings. I felt at times a sort of rising cry, 'Ah, poor bird, nothing can save him; he must be killed!' When, flapping his little pinions, away he went, cleaving the air for a mile, skimming now and then over the surface of the sea, and after making a circuit, returning to his friends.

"Amidst the myriads of old ones, I looked in vain for anything like a corresponding number of young; I could scarcely see a single individual. It is true that the females only produce one egg, but still that could not account for the paucity of progeny. I suspect, from certain sympathetic croakings uttered by the old ones, when turning their heads towards little chinks, the recesses of which were invisible, that the infant birds were kept in the background;

and well they are so, or otherwise in the constant disturbances and tumblings over that take place, they must inevitably break their necks in the confusion.

"The Razor-bills are by no means so numerous as the Guillemots, and, generally speaking, do not mingle with them. They seem to hold themselves apart as the better bird of the two, peering at one another, and pluming their coats with a sort of dandy consciousness of their superior brilliancy and glossiness. But both agreed in keeping aloof from me; there was nothing like intrusion on the spot I selected for observing them. Not so the Gulls, at least, the common Gulls, *larus canus.* They are all familiarity; some flew so near that I could almost feel the fanning of their wings; while others settled within a few yards, conning me over with a vacant simple stare, uttering their plaintive, melancholy, imploring sort of note; while, on the other hand, a pair or two of large black beaked Gulls, *larus marinus*, now and then sailed by, and then alighted on an unassailable ledge, reconnoitring me with a scrutinising look from keen, suspicious, penetrating eyes, expressing a very different language. The former barely opening their slender beaks sufficiently to give vent to a gentle cry seemed to say, 'we are poor harmless creatures, do not hurt us.' The latter, on the other hand, the moment they had perched, opened theirs as wide as possible, uttering at the same time a loud, hearty scream, *ab imo pectore*, as much as to say, 'This is our territory, you have no business here; we wish you would go away.' Not far from the resting place of this pair of black-beaked Gulls a pair of the common sort had established themselves on a bit of plateau that made one giddy to look at, and quite tremble for the fate of their sole offspring, a little grey, down-covered toddler, with about half an inch between his toes and destruction, for a breath would have blown him over; but there he stood, quite at his ease, so well tutored apparently, that when the old ones successively returned with food, he was indifference itself. No tremulous movement of his flappers, no impatient stretching of neck or gaping of mouth like other young birds. I cannot conceive a more melancholy advance from infancy to maturity than this youngster's, it being evident, from the moment of his quitting his eggshell to the present hour, the choice of standing on his right or left leg, or a cautious putting of one before the other to the extent of a few inches, was the only source of amusement and variety within his reach.

"I was curious to observe the proceedings of many of the older birds. The din was incessant, and some seemed quite exhausted with screaming or hearing others scream, for I could perceive them retiring from the main body to rest awhile in perfect silence. Now and then, indeed, as if by mutual consent, the uproar entirely ceased, and the whole body settled on a rocky inclined plain, interspersed with grass to some extent, just below the light keepers' dwellings, which form their grand nursery establishment. There, in every stage of growth, hundreds and hundreds of young ones were moving about. I conclude that each parent had a perfect knowledge of its own nestling, though, generally speaking, there were no striking symptoms of recognition—old and young seemed to mingle without much reference to relationship, and a stranger might have supposed that there was a community of offspring. The only sign of attachment was that an old bird would now and then fix its eye in a more pointed manner on some one of these moveable puff balls of downy, and then suddenly opening its mouth, deposit at the feet of the fledgling a crawful of half-digested shrimps, or soft crabs."

Blackwood gives us a delightful history of these interesting creatures from the period when the works were commenced for the erection of the light tower, 1808. The appearance of the workmen with their operations of blasting and other unusual movements, so disturbed the birds that the writer states, with the exception of one pair of Gulls, the whole body, including the Guillemots and Razor-bills, took flight and, for a time, deserted a spot which, from a period unknown, they had occupied by a sort of prescriptive right. Although occasionally annoyed by other birds, as well as by accidental visitors from the mainland, one solitary pair had taken their post on an inaccessible plateau of bare rock, and seemed to be aware that nothing but shot or stones could dislodge them. Their determined confidence in the security of their stronghold met with its due reward, orders being given that none should molest them. The consequence was, that in a short time, they became quite familiarised to the noise and bustle, and remained until their young were reared, and in a condition to shift for themselves.

"In the ensuing spring the same pair, as was supposed, retook possession of their old post, and strict orders, as before, were given on no account to disturb them, and then, as a further protection, no firearms were allowed to be used, and any strangers disregarding these rules were not to be admitted on the island. In consequence of a rigid attention to these humane regulations, the same pair continued for five successive years to visit the same ledge and rear their young, consisting generally of two, and never exceeding three, in number. But, although only this single pair were observed to breed on the island, a considerable number at times, as if aware of their security, sought shelter, denied them on the mainland, where, notwithstanding the bare and perpendicular character of the precipices, there was scarce a spot among the clefts and hollows to which young men and boys of the neighbourhood did not find their way in search of eggs, for which they found a ready demand.

"The main body of Gulls at length finding that their wonted haunts no longer afforded security, and, whether taught by the experience of the above pair, or from their own observation, in the spring of the sixth year took refuge on the island, chiefly on the south side and on the inclined plain near the light towers, where they have remained during the breeding season ever since; and on this spot, in particular, their artless nests are spread in such numbers that it is difficult at times to avoid treading on them. It is remarkable, however, that only two pairs of *black beaked* Gulls returned, and these, according to their usual habit, not only breed apart, but never herd with the rest. Neither have the Guillemots and Razor-bills re-established themselves in the same abundance, or with the same confidence, which may in some degree be accounted for by the parts of the rock most suited to their habits having been more or less used as landing places."

Mr. Yarrell enumerates thirteen species of true Gulls. There are many curious and interesting circumstances connected with their migration. We have seen from the above, which describes the families on the Stack, some time about the month of June, 1830, that there was only a single pair or two of the black beaked, or headed, Gulls seen in the vast assemblage. On the visit of the Nelly not a single pair could be detected, yet in the winter months there are legions, not only on this particular portion of the coast, but every other. In the spring they retire to what may be termed their inland breeding grounds, of which there are several near different parts of the coast, and I may merely say at present—as during our cruise I may have to return to this branch of the subject again—that Mr. R. Bushell, of Bolton, who, a summer ago, made an especial visit to one of these breeding grounds near Fleetwood, has kindly furnished me with every interesting detail: this, with other information, will enable me to compile much information concerning, not only the habits of this one species, but of all the members of the interesting genus. The light-keepers confirm in every respect many of these extraordinary facts; they positively state that on the night of the 10th of February those that are absent during the previous half-year, or rather from the 10th of August, all return instinctively to the South Stack. They also state, that in the middle of the former night they are warned of their arrival by a great noise, as it were a mutual greeting and cheering, adding, that they look to their return as that of so many old acquaintances after a long absence, announcing the winter to be over and spring approaching.

The importance of the tower has long been recognised; exclusive of that there are other dwellings for the accommodation of the light-keepers, and thus a spot formerly rented for a few shillings for the summer pasture of a few sheep, has become an object of interest to the public. To the geologist and naturalist it must indeed have been always so. The histories of the island bridge, etc., from the causes which first brought them into notice, to their present state, are well deserving attention; and I much regret that other demands on my space will not permit me to add further extracts from the ably written chronicles from which I have been enabled to compile what, I trust, will be at least interesting.

CHAPTER VIII.

"Once more upon the waters! yet once more!
And the waves bound beneath me as a steed
That knows his rider. Welcome to their roar!
Swift be their guidance, wheresoe'er they lead!
Though the strain'd mast should quiver as a reed,
And the rent canvas fluttering strew the gale,
Still must I on; for I am as a weed,
Flung from the rock, on Ocean's foam to sail,
Whene'er the surge may sweep, the tempest breath prevail."
CHILDE HAROLD, CANTO III.

BARDSEY ISLE.

FROM the breakwater head to the Skerries and the rocky islet West Mause, in moderate weather and an off shore wind, is good dredging ground; as are also the little bays between Salt Island and Point Cuomels. In steering north-east we pass over immense forests of tangle and oar weeds, then shell and shingle, and luxuriant meadows of grass-wrack; and each character of sea floor requires its peculiar implement. Over sand, shingle, and mud, Ball's, or the naturalist dredge, will answer best; but in deep water, or rather over the coralline zone, the heavy canvas dredge will alone be successful; a third is also required over sand banks, which is a modification of the trawl net, called the keer drag. These, and other implements which the naturalist requires, I will describe as we proceed, but over the dense forest of strong, gigantic, seaweeds, we require an instrument called a drag. This consists of a transverse bar of iron, to which is attached a series of hooks of great strength, and secured to about ten fathoms of strong cable chain, and the tow-rope, which must be paid out to at least four times the depth of the water, so as to allow the chain to trail along the ground. The hooks, which are formed in the same manner as a grapnel, become entangled in the roots of sea-weeds, and will generally bring up the largest plants entire, and very frequently a portion of the rock on which they grew. It is also very effective in bringing up large masses of the grass-wrack; and, in case of need, with a powerful boat running free before the wind, the deep sea dredge can be towed behind the drag, and capture many animals disturbed by the chain and last-named instrument. The contents of the dredge, the roots and fronds of the sea-weed, are frequently marvellous, and find us full occupation for many hours in sorting them. The beautiful *Ptilota plumosa* is altogether confined to the stems of the *Laminaria digitata*, and these stems are also the favourite habitat of many others of the more delicate *Floridæ*. *Callithamnion pluma*, a minute but very beautiful species, forms upon them a covering resembling fine crimson velvet; *Delesseria ruscifolia*, *Rhodymenia palmetta*, *Polysiphonia ureeolata*, are also commonly found parasitic on the fronds and stems of the larger oar weeds. But it is the wonderful variety and number of animals that so frequently nestle in the twisted roots, and cover the stems and fronds, that render this mode of dredging so attractive. Sea-slugs, or naked gilled molluscs, two elegant varieties of the *Patella*, *Sertularian* zoophytes, beautiful kinds of *Botryllus* and other compound Ascidians, sponges, gasteropodous molluscs, are frequently tenants of a single plant.

The bulb of the *L. bulbosa* will often contain a colony of the *Patella pellucida*, or *P. laris*, which are both remarkable for their beautiful longitudinal streaks of iridescent colours on an olive shell. These little animals feed on the stem and leaves of the plant, and to them may be attributed the annual destruction of the gigantic Algæ. The first-named feeding on the leaves, the latter on the fibres of the roots and fleshy stems, so far weakens the base that they are torn up by the storm, and strew the shore with tons of sea wrack.

A few days dredging, with the aid of fine breezes, has concluded our investigation on this portion of the coast. Its deep water zoology varies only slightly from that of the Menai. Of molluscs the predominant species are Anecinoides, Trochoides, Purples, Patellas, Littorinæ; of the naked gilled, *Doris tuberculata, D. flammea, Dendronotus aborescens, Doto coronata, Eolis coronata, E. pellucida, Echinoderms.* The purple-tipped and common Sea Urchin, common Sand Star, the Gray Brittle Star, lesser Sand Star, Violet Cross Fish, and the common Cross Fish. But the mere names, or a pair of Latin names, convey but a poor idea to an uninitiated reader; therefore, we will return to one or two of our most prominent captives; and, as we have several of the beautiful Dendronotus, we will first take a look at that interesting creature. "If I call it a slug," says Mr. Gosse, "I hope you will not take a prejudice against it, as if it were anything like the slimy, grey pests that put you so out of patience when you walk along your flower-beds on a spring morning."

It is, however, a slug-like animal, of elegant taper form, almost linear, with the head protected by an expansion, from the margin of which radiate a number of little branched processes that look like tiny trees. Just behind this "veil," as it is called, there stand up from the back two hollow, fleshy pillars, each of which has its orifice adorned with a sort of expanded frill of similar shrub-like filaments; from the hollows protrude tentacles of elaborate structure, each consisting of a swelling pillar, the sides of which are beset with a number of sloping, but parallel narrow plates or ridges set on edgewise. All down the back, running in two rows, one on each side, are erect trees—so strangely is this characteristic arborescence repeated over and over again—much branched and rebranched, so that they have been compared to the ramifications of a piece of coral. The colours of this animal are as elegant as its form.

It consists of a somewhat pellucid, tremulous flesh, of a very pale yellow tint, streaked and variegated with chesnut brown in an irregular pattern, the whole studded with opaque white specks. It crawls rapidly about on the slender sea-weeds, holding fast by its very long and narrow foot, and gliding in and out among the fronds of the *Zostera marina* with much grace; its appearance, (especially when gliding over some dark purple *Chondrus*, or *Rhodomela*) is particularly pleasing.

Almost every haul of the dredge, in the shallower waters of Bulkley Bay, will bring up some member of the genus *Ophiura;* but the least abundant is the common Sand Star, *Ophiura texturata.* The *Ophiuridœ* are so named from the long serpent, or worm-like, arms which are appended to their round, depressed, urchin-like bodies. Although they have been associated by many naturalists with the true Star-fishes and have been made a family of *Asteriade*, Forbes states they are as distinct from those animals as they are from Crinord Star-fishes. In fact, they hold the same relation to the Crindeæ that the true Starfishes hold to the Sea Urchins. The Ophiuridæ are always regularly radiate, and they seldom vary in the number of their parts. With them the number *five* is absolute. Colours and proportions are subject to variation in this order. Generic characters among them are founded on the simplicity or complexity of the arms, the mode of their insertion, and on the forms of the plates which separate their origins beneath. The sources of specific character are derived from the spines and scales of the body and arms, and the proportions of arms and disks. Colour is variable in all the known species.

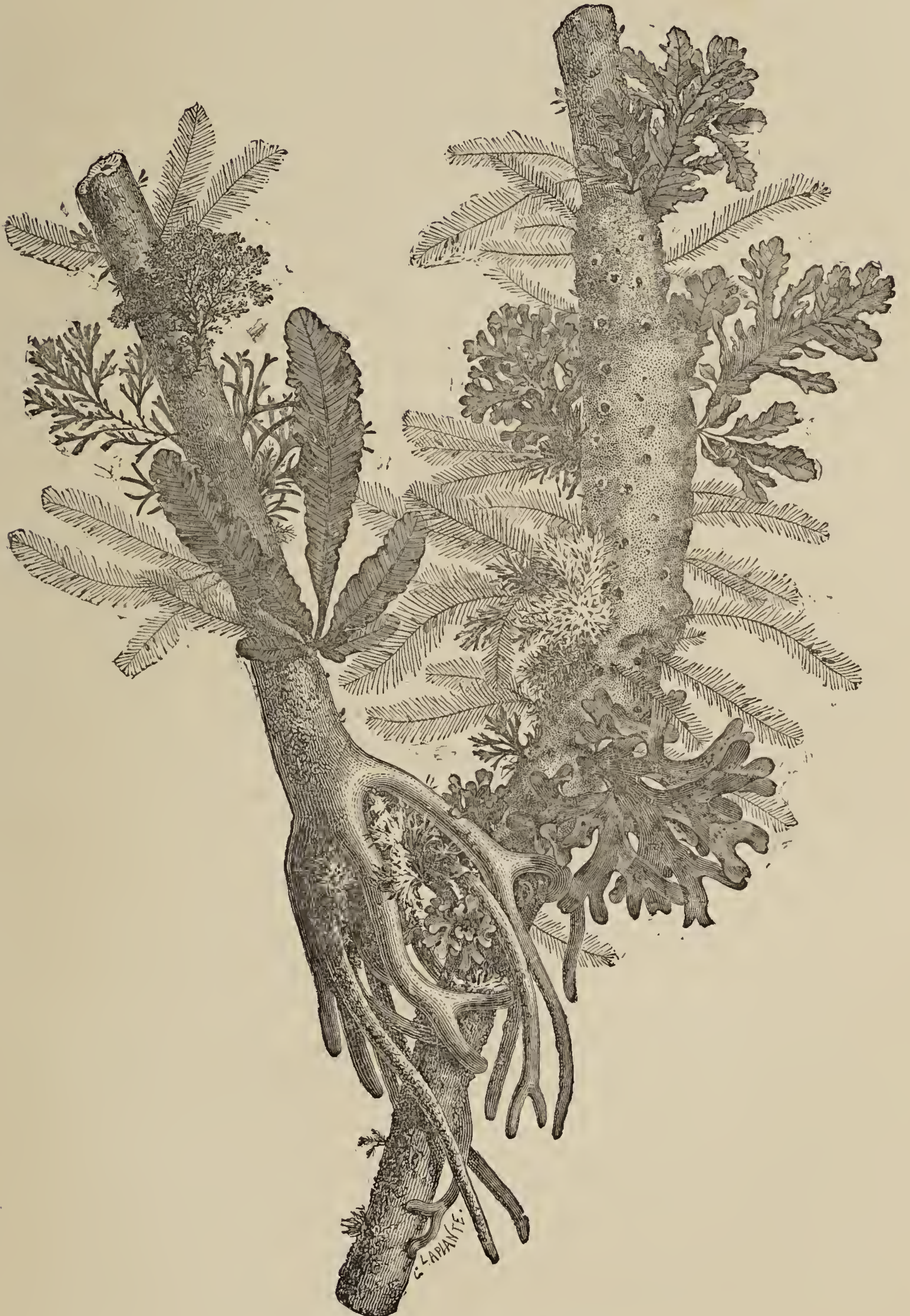
The common Sand Star, *O texturata*, has a regular round disk, into which the arms are, as it were, dovetailed above. This disk is covered with small, smooth scales, rosulated in the centre, round which many of the scales are exceedingly small. Opposite the insertion of each ray are two triangular plates, which diverge and separate from each other throughout their length by two large transverse scales. The rays are long, tapering to a very fine extremity, and obtusely carinate. The scales which cover them are very broad and narrow. Beneath they are clothed with small tenticular plates. The marginal plates are prominent and rounded, those nearest the base have seven short, flattened, obtuse spines; those uppermost longest, but the number diminishes with the breadth of the rays. The scales of the disk clasping the bases of the rays, have from twenty to twenty-five teeth, or little spines. The plates between the origins of the rays beneath are large and fiddle shaped. The disks of the largest specimens do not exceed nine-tenths of an inch broad, and the rays vary from three times the length of the disk's breadth, or even less, to five times as large. The disk is generally reddish, marbled with purple brown, the sides white, and the under surface and spines are generally pale yellowish or white. The lesser Sand Star is far more abundant than the preceding, and until Forbes distinguished it and separated it from the *O texturata*, giving it the name *O albida*, it was generally confounded with its rarer relative. It is remarkably sluggish, and Forbes remarks, that when one of these creatures is put into a vessel of salt water it will remain quiet for some time, contrary to the habit of the Brittle Stars, and then slowly move its arms up and down. Should it be placed on its back, that position appears to be very disagreeable to it, for it immediately proceeds to change it by raising its body to a perpendicular and tumbling over. This it effects by bending two or three of the rays into an arch, leaving the others straight and spread out. When alive the disk is generally pink, with ten white spots, which occupy half of each of the ten plates opposite the ray origins. The centre of the arms is pink, the under surface and spines white, the cirrhi and tentacula are tipped with yellow, sometimes the disk is marbled with orange spots, but it only retains these colours when in life. The dried specimens are purely white. "The rays of the Sand Stars have a whip-like, or lizard tail, appearance; those of the Brittle Stars look like so many Centipedes or Annelides, attached at regular distances around a Sea Urchin. The latter are much more flexible than the former, more irritable, more brittle, nevertheless, more tenacious of life. When dried, the spines of the Brittle Star stand out from the ray, whereas, in the preserved Sand Star they are pressed to its sides. The cirrhi too, in the living animal, which are seen between each row of the spines are pinnate, or as if covered with short tubes in the Ophiocomæ. The Brittle Stars are much more active animals than the Ophiuræ; they seldom remain quiet for a moment, but are continually twisting their arms about; and if laid hold of, they break up into little pieces with wonderful facility, each fragment of an arm also breaking itself up into smaller pieces; and frequently when we seize one of these creatures, in a moment we find nothing but the disk remaining. They can reproduce their arms in the same way as the *Asteriadæ*."

This habit of breaking themselves into pieces when captured, renders it very difficult to preserve them for collections. Dr. Johnston has given directions for their preservation in the ninth volume of the "Magazine of Natural History." But the late Professor Forbes recommends another mode, which saves time, and is much more convenient to the travelling naturalist or collector, and answers the purpose fully. It is this, "Drop the Sand or Brittle Star as soon as possible into fresh water ('spring water'), let it lie for an hour or so, and then dip it for a moment in boiling water; it is then dried in the sun, or in a current of air, which will be effected in a very short time, and packed in paper. By such a simple process, as many specimens as the collector pleases may be dried and put away in a couple of hours."

The fresh water acts as a poison on the Ophiuræ, as it will on most other marine animals, and kills instantaneously. With every convenience on board the Nelly, this plan has been adopted with the most perfect success, and is rendered perfectly certain by, the moment the dredge appears, if seen to contain the Stars or the more difficult *Comatula*, reversing the net and its contents into a vessel of cold spring water, in which is placed a large piece of ice. No matter what marine creatures the net may contain, life in a moment ceases, and the specimens become rigid and can be dried at convenience.

Perhaps one of the most beautiful tribes of creatures found flourishing on the stems of the tangles are some species of the *Sertulariæ*.

It is one of those dubious forms which, resembling feathers, more or less stiff and angular, more or less flexible and plumose, so often thrown up by the waves among the sea-weeds, and are



PARASITES ON SEA WEED.

always to be seen incorporated with them in those dried weed baskets which are made up in watering places and offered for sale. "None but a naturalist," Mr. Gosse writes in his book, "truly suspects that they are not as truly marine plants as the Algæ which they accompany, so plantlike is their appearance and manner of growth; and though their whitish colour might induce a passing suspicion of their vegetable character, a glance at that tuft of *Corallina* by their side, bleached as white as snow, dispels the thought, and confirms your confidence that they are veritable sea weeds. Yet they are as truly animals as you or I; for though we call them Zoophytes—that is 'animal plants'—they have an essentially animal nature, though of a low grade. They have muscular, nervous, circulating, digestive systems, special organs of sense, special weapons of offence; some of these, it is true, not distinctly appreciable to our observation, but inferable by legitimate deduction from observed phenomena; as when we presume a nervous system from the sensitiveness to touch in the tentacles, from the existence of those minute and most wonderful thread-cells, and from the visual spherules in the medusoides of the *campanulariadœ.*" Professor T. Rymer Jones's Memoir of the Sertularian Hydroza—the accurate and beautiful figures and sections of the stems enclosing the animals, their mode of generation—is everything that the scientific student can require; but Mr. Goss's more popular and elegant pen-picture of these extraordinary Zoophytes will convey, as I wish, to the general reader the exact impression of the true nature of the group of little feathery branches on these stems of sea-weeds.

"A horny, tubular fibre, no thicker than sewing cotton, creeps irregularly* over a shell or the stem of a sea-weed, adhering firmly to the surface; as it grows, here and there it shoots up a free branch in an erect position, like a stem of a plant springing from a creeping root. This stem-thread, if examined now with magnifying power, is seen to be jointed, and the joints look as if they had been formed by twisting the thread round and round, while from each joint, on alternate sides, spring little rose-like buds, which are hollow cells, with a rim cut into four teeth. As the thread grows it branches, each branch continuing to produce buds or cells, while at the angles of the branches are occasionally seated vase-like bodies, in shape much like the cells, but greatly superior in size and covered with transverse rings or strong wrinkles, whence the name *polyzonias.*"

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* Animal Kingdom, p. 92, section 215.

All this you may see in the hundred specimens that you pick up among the refuse weed; for all this is formed of the common horny skin that constitutes the skeleton. But supposing you had taken one out of the samples I have just dredged from the sea-floor, and put it just as it was, in full health and vigour, into a glass box of water, and placed upon the stage of a microscope, you would see something more. You would see running through the fibrous root thread, and all up the centre of the slender tubular stem, a clear yellowish granular matter, like a marrow or pith, in which you would discern the movement of a fluid, carrying with it many round grains in an irregular and wayward circulation.

This medullary core sends off a branch at every cell, which, passing through its perforated base, expands within the vase-like cavity, and forms a living Polype, capable of alternate protrusion far beyond the rim of its dwelling, or of contraction into a shapeless lump down in its bottom. We watch it slowly expanding; a bundle of flexible gelatinous fingers are gradually pushed forth, which stretch out like the spokes of a wheel, radiating horizontally, or winding with a double curve, like the branches of a chandelier. These are the tentacles, organs destined to detect and to seize and to convey to the mouth, any unfortunate living wight that may incautiously roam too near the perilous star, provided it be small and weak enough to be arrested and devoured. The body, which is now stretched out to a slender clear thread, full of circulating granules, puts out a wart-like prominence from the centre of the rays; and here there is an orifice of no particular shape or size, the supple lips which bound it being capable of indefinite expansion to engulf its prey. If we apply a very high magnifying power to the tentacles, they appear to be set with irregular knots and prominences, much like a very rough thorn stick; but this irregularity is dependent on the irregular contraction of the tentacle, for, if evenly extended, the prominences are seen to be uniformly placed in rings, or annular bands, throughout the length. Each wart contains a thread cell of ovate shape, imbedded in the common substance, the extremity pointing outward, ready, on the stimulus of the animal's consciousness of prey, to shoot forth its missile weapon.

The nature and effect of these flexible javelins, with their subtile poison barbs, will require a much closer examination than these minute creatures will enable us to make satisfactorily, and which they possess in equal perfection with the more highly organised *Actiniæ* and *Acalephæ.*

It was these beautiful and minute animals, so closely resembling tufts of a pretty sea-weed, that attracted the attention of Peyssonel, when seeking on the shore of the Mediterranean for some new pharmaceutic agent.

Our own Ellis, when gathering choice specimens of Algæ for his lovely pictures and ornaments, was first struck with the sensitive motion and activity of the minute thread-like filaments, and this led his penetrating mind to investigate their nature, and to discover their true animal character. Many of the tribes are extremely minute—their polypes being scarcely visible to the naked eye. If we consider for a moment the imperfect state of all optical instruments upwards of a century ago, our wonder and surprise is increased that so important and gratifying discoveries should have been made. Ellis alludes to these imperfections of the instrument in one of those clear and lucid letters in which he answered the many virulent attacks that were made by Pallas, and other opponents of the animal theory. So remarkable are these letters for their clear arrangement, so candid and honourable in their bearing, so convincing, so expressive, so conscious of his superior knowledge both of marine botany and zoophytology, that they remain to this day a monument of his patient and extraordinary genius.

He says :—" I hoped to have clearly demonstrated long before this, for I have plainly seen, and I have endeavoured to show mankind, that the softer and harder parts of zoophytes are so clearly connected with one another, that they cannot separately exist, and, therefore, have not hesitated to call them constituent parts of the same body, and that polype-like suckers are so many mouths. As there can be no doubt, but every part of what is called a coralline is necessary to make out such an animal or being, it will be very difficult, if not obviously almost impossible, to determine the proportion there ought to be between softer and harder parts; and therefore, it cannot be thought unreasonable to say that in some of this tribe the stony parts are much the greater part of the whole. Sertularia are covered with a stony or calcareous crust; if their mouths should happen to be very small, their number make up that deficiency. We see in the greatest number of corallines their surface full of holes; we saw the same in *Esharas* and *Millepores* thirty years ago; since that time *magnifying glasses have been improved*, so as to show us that they are all orifices for polype-like suckers; why should not we admit *that glasses may be still more improved*, so as even to make us able to see what may be the intention and use of these minute orifices, which, according to all rules of reasoning, we must suppose to approach in nature to them?" We are now well acquainted with the importance and valuable aid obtained by the microscope, and can see the difficulties surrounding the investigations of the early zootomists.

A summer storm is seldom of long duration, but one in all its fury has overtaken us. A tempest, blowing from the south-west, will preclude even shore hunting on such a formidable coast as that near Holyhead. The patience of our sailing-master has been well nigh exhausted. The Nelly, we have been told each morningstide, when there has been a single streak of a bright cloud, is not used to be skulking in the harbour when she might spread her wings and away. "I'll show you," says our angry captain, "'Ireland's eye, if you'll only get your traps on board before it's again daylight.'" Very tempting, doubtless; but sound, fleet, and safe, as we know the Nelly to be, even the prospect of lovely Dublin Bay is no temptation, and we quietly sort and dispatch our collection to its destination, and abide our time, or, until favouring gales will waft us to famed *Ynys Enlli*—Bardsey Isle—the retreat of holy bards and saints of ancient days. Nor have we long to wait; the favourable moment arrives; once again we are upon the waters; and with a fine fresh gale, and under double-reefed sails, are skimming past the South Stack, while the heavy sea and broken waves are curling over the lantern of the white tower. Soon we have left its noble face far astern, and, as it dips in the western horizon, the bold promontory of Llyen stretches its massive, grand, and romantic cliffs before us. The coast scenery in every direction is of the grandest and most sublime character, and a scene that will ever dwell favourably in my memory. It is an old and favourite cruising ground; its fierce currents and hidden rocks no doubt have their terrors, but they have none for us; and long before the deep shades of night have closed, we are riding safe and secure in the little harbour of Aberdaron. Taking up my quarters in the little village inn, my wants are soon supplied. I have no need of an interpreter for the present cruise. The requirements of the English voyager, who catches "them worm things," are well known; a good sea-boat, strong arms, boiled crabs, fresh butter, home-made bread, and a jug of genuine Welsh ale, and he will be content.

There is nothing to induce us to prolong our stay at this primitive and little-known village—once a place of great renown, but a mere speck now of twenty odd cottages, far beyond the influence or bustle of railways. A local boat from the island gives an opportunity of crossing over the fierce current to the little rocky islet, leaving our Nelly to follow the first favourable tide.

The difficulties of the navigation between the main and the islet have by no means been overstated by many English tourists; and, like the famous Eddystone, it may, at times, be easy to pay a visit to its noble light-house, solitary and alone, lifting its proud head in ocean's midst and the howling tempest; but not always so easy to depart from it. The Island is of a triangular shape, about two miles in length; at the north-east end it rises very precipitously, and is about three-quarters of a mile in breadth, tapering to a point at the south end, from which runs a dangerous spur or reef, indicated by a fine light-house, 108 feet above the sea level. Its inhabitants number about 100, and are employed principally in crab and lobster fishing. Of the former edible there is great abundance, and much care and foresight are exercised in gathering only such as are marketable and free from spawn. Rabbits are plentiful, and sea-birds in myriads; both, in some measure, help to eke out the means of subsistence. Large numbers of eggs are collected, which find ready sale. The inhabitants are a peculiar people, governed by their own sovereign, who is elected from their own body, whose power is all-important, and who settles all disputes according to their own laws. To the antiquary the island is of some importance. Giraldus Cambrencis thus mentions it:—"Beyond Lhyn there is a small island, inhabited by religious monks, called Cœlibes or Colided. This island, either from the wholesomeness of its climate, owing to its vicinity to Ireland, or rather from some miracle obtained by the merit of the saints, has this wonderful peculiarity, that old people die first, because diseases are uncommon, and scarcely any die except from extreme old age. The name is Enhli, in Welsh, and Berdesey in the Saxon language; and many bodies of saints are said to be buried there, and amongst them that of Daniel, Bishop of Bangor."

There is little that remains beyond a portion of a tower, of the thirteenth century, of the once famous abbey of St. Mary, of which a very interesting account is given by the Rev. H. L. Jones, in the Archælogia, vol. i., first series. During the summer months, excursion steamers from Aberystwith and the fashionable watering-places on the Welsh coast and the Menai frequently visit it, and land there hundreds of gay tourists, who not only gratify themselves by its strange primitive customs and general appearance, but are a considerable source of profit to the Bardsey islanders. To the naturalist it presents unusual attractions. Its rocks are split into thousands of fissures and tide pools, abounding in considerably more than the average variety of marine life. Perhaps on no other isolated rock is found the common smooth-skinned sea anemone—the Beadlet, so brilliant in colour, so beautifully clear and bright, and of so many rich hues; so vigorous, active, and freely expanding. In many of the higher pools so richly are they strewn, as to give a tint to the transparent water. Two exquisite varieties of this species are found near low water mark; the Strawberry, as it is familiarly named by Mr. Gosse—*Fragacea;* one of these varieties is rare. The azure spherules are substituted for a necklet of *oriental pearls*, brilliant enough to form the rich coronet of a lovely bride. The tentacles are also very beautiful, shading from rich rose to pale pink and pearly white. If I add the Dahlia and the Opelet, I have named the prominent species; others are not over-abundant. But the Opelet, *Anthea cereus*, is so abundant, and so remarkably fine in size and colour, as to deserve more than a passing notice. The genus contains but one British species; in the number of its varieties few surpass it. *Base* slightly adherent, broader than the column; its outline irregularly undulate. *Column* forming a low thick pillar, the summit expanding; the margin notched and bearing budding tentacles, with no distinct parapet or fosse; surface cancellated by the intersection of longitudinal furrows and transverse wrinkles; no suckers, warts, nor loop-holes; substance pulpy. *Disk* membranous, very expansible, undulate at the margin. *Tentacles* numerous in several rows, sub-marginal, very long, lax, irregularly flexuous, scarcely retractible; mouth elevated on a low cylindrical wart. In colour they are very various, but generally the plain shades of olive, slate, and drab; green, white, and variegated tentacles; but by far the greater number are self-colours; the column, disk, and tentacles, of the same shade. But the most admired of all the varieties is the olive column, or dark bistre-brown; the tentacles of a rich shade of green, with a satiny lustre, tipped with rosy pink, or lilac. This is the species which, Mr. Gosse concludes, attracted the notice of the poet Southey, when, in the retirement of our wild western shores, he was meditating his oriental poems, and which he has interwoven into their beautiful imagery :—

> "Meantime, with fuller reach and stronger swells,
> Wave after wave advanced ;
> Each following billow lifted his last foam,
> That trembled on the sand with rainbow hues :
> The living flower, that rooted to the rock,
> Late from the thinner element
> Shrank down with its purple stem to sleep,
> Now feels the water, and, again
> Awakening, blossoms out
> All its green anther necks."

"Whether in its native freedom, fringing the edges of some shallow rock basin ; or waving its silky tentacles 'like streamers wide outflowing,' now expanding, now concealed among the black fronds of some undulating *Fucus* to which it is clinging ; or throwing them into fitful, snake-like contortions, as it hangs from the rock-work of some well kept aquarium—the *Anthea*, especially the emerald variety, is an exquisitely beautiful object. Its wonted liveliness also makes it more than usually interesting in the last named condition ; for, not only are its tentacles continually in motion, but the animal itself is very restless, frequently changing its place, and that with so much activity that the process can be readily watched by the eye." The following graphic notice of this lovely creature is not an unusual condition, for I frequently have seen them on coasts where they are in equal numbers and under precisely the same circumstances. "I had," writes Mr. Robert Patterson, of Belfast, "on one occasion the pleasure of seeing the *Anthea* under circumstances I shall not readily forget. Outside the belt of sand and rocks that is left uncovered at every tide (on the south side of Belfast Lough) is another, where the large sea-weeds, such as the tangles and sea furbelows, flourish. * * * * As our boat drew nigh to the shore, the large spreading fronds of the sea-weed became more and more distinct until each was perfectly revealed to us below the unruffled surface of the sea. We had come at the time of low water, and, as we floated onward, could mark the glorious submarine forest which was beneath our boat. It rose and fell, it heaved and sank as gracefully as the meadow yields to the breeze, or as the willows bow to the breath of April. As we came into shallower water, the broad outspread fronds of the sea-weed seemed studded with blossoms. What could they be? A few moments more disclosed the mystery; each blossom was endued with life and motion—it was a living *Anthea!*"

The urticating or stinging power of the *Anthea* is considerable. I myself have frequently experienced its annoying effects. Though sensible pain, or irritation, does not invariably follow the contact of the human skin with the tentacles of the animal. But, as we shall find on further investigation of this knotty point, upon which naturalists widely differ, dissection will reveal the true cause. The reproductive system is too important to be fully discussed at nearly the close of a chapter; but a few words may be said of the extraordinary statements that have been made as to its reproduction by fission. That it takes place rather by a longitudinal division of the entire animal from above, downwards, is possible, or by separation of small fragments from the edge of the base, which soon develop themselves into minute and apparently young individuals. The latter mode, doubtless, is normal with several of the species. The former mode, Mr. Gosse states, *appears* not to be uncommon with the *Anthea cereus*, and that it is not unusual for this species to become two animals by perpendicular division. The whole process has been observed. A little notch first appears in the margin of the disk, which extends, through the tentacles, and splitting the disk across, and gradually cutting its way to the opposite side, till it divides there the margin also. Meanwhile, it has advanced downward in equal ratio until it has reached the base, and at length we have two sections of the animal. Now, however, the two raw and open surfaces close up, and the bases glide gradually apart; a thick wall of flesh forms between the stomach and the wound, and new tentacles develop themselves on this; the two distinct *Antheas* are then perfect. The Abbe Dicquemare relates several curious experiments on the multiplication of these animals by mechanical division. When transversely divided, the upper portion still stretched out its tentacles in search of food, which, on being swallowed, is sometimes passed through its mutilated body, but was occasionally retained and digested. In about two months, tentacles grew from the cut extremity of the other portion, and these soon afterwards began to seize prey. By similar sections, he even succeeded in making an animal with a mouth at each end. The Actinia, Professor T. Rymer Jones states, are very patient of injury, and rival the Hydra in their reproductive powers. If the tentacula are clipped off they soon grow again. Nay, more, it seems that these reproductions might extend as far, or be as often repeated, as patience or curiosity would admit. If cut transversely through the middle, the lower portion of the body will, after a time, produce new tentacula, pretty nearly as they were before the operation, while the upper portion swallows food as if nothing had happened, permitting it, indeed, at first, to come out at the opposite end—just as a man's head being cut off, would let out at the neck the bit taken in at the mouth—but which it soon learns to retain and digest in a proper manner. But this is merely quoting the statements of Dicquemare, and yet, on the same authority, a wound or rent of the base of the Actinia often proves fatal.

To such an extent did the Abbe carry these experiments, that it became politic to offer something like an apology for their seeming cruelty, which he correctly thought some might be inclined to lay to his charge. "But, I think," he says, "that on taking into account the results of my experiments, the animals ought rather to congratulate each other upon having been the subjects of them; for not only have I succeeded in extending the duration of their lives, but have made them young again. *Ce qui n'est pas un petit avantage.*" Let the conclusions drawn from these experiments be what they may, out of the many thousands that I have collected, and others that I have known to be gathered by skilful men, in no one instance do I remember any of the species recovering an injury to any portion of the disk column or base; and I am satisfied that Delle Chiaje is correct in his opinion that they can do no more than reproduce injured tentacula. That the Anthea divides spontaneously is doubtless correct; all evidence tends to support the theory. In the aquarium it is the most restless of all the species; never content many days together with the most favoured position it may select. Mr. Gosse informs us, "The power exercised by this species, pre-eminently, of inflating portions of its body, swelling them out in large tumid lobes separated by deep *sulci* from the rest of the circumference assists it in crawling. We will suppose the *Anthea* resting on the bottom of the vessel, when it feels a desire to mount the sides of the glass. Pushing out a great inflated lobe towards that side the sole of which is free from the surface, it takes hold of the glass with the edge of the lobe; and when the contact is firm, relaxing its former hold, it slowly drags forward the body until the lobe is again lost in the general circumference, or even till the body projects in two smaller lobes, one on each side of the principal one. The base being now made firmly to adhere, again the lobe is freed, and again protruded, and the same process is repeated until the animal is satisfied with the position it has gained. Some times this is at midheight, the intertwined tentacles streaming loosely down by their own weight. At other times it rises to the very water's edge, and even thrusts out its base in an inverted position upon the surface of the water, as if it would float by the mere contact of the dry base with the air, just as the *Limneœ* and other *Mollusca* do. Not seldom does it boldly break the tie that connects it with the side of the vessel, and actually swim, or at least, passively float with its base in contact with the inferior surface of the superincumbent stratum of air. A little shaking of the vessel, however, causes the water to overflow the frail boat, which had hitherto been dry, when the animal instantly falls prone to the bottom.

No very special care is required to maintain the health and vigour of the Opelet in captivity. As to situation, we have stated it will select for itself the position its wayward will may most fancy; and if the water be kept in a state of purity, the lovely creature will survive an indefinite period. It needs to be fed at frequent intervals, or it will droop and die, for it is one of the most voracious of its class. Flesh or fish is equally acceptable, a fragment of an oyster, cockle, or mussel for preference. Nothing comes amiss provided it be fresh and pure. No creature is more easily detached from its native rock. The back of the finger-nail will remove them, or if the pool (and they are rarely found uncovered by water), is bailed out they will detach themselves by their own weight, and in a few minutes be found on the floor of the pool, much resembling a tangle of rich coloured silken cords.

Our visit to the almost unknown Island of Bardsey has drawn to a conclusion, and our last ramble is to the lonely point where stands the lighthouse, and where our Nelly is making short tacks, waiting the boat, to take us from this dangerous shore. The strong currents render dredging totally impracticable, therefore our signal is made, and once more on board the Nelly, on a glorious summer's evening, we hoist all sail and bid farewell to *Enys Enlli.*

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CHAPTER IX.

"Pass we the long, unvarying course, the track
Oft trod, that never leaves a trace behind;
Pass we the calm, the gale, the change, the tack,
And each well known caprice of wave and wind;
Pass we joys and sorrows sailors find,
Cooped in their winged, sea-girt citadel;
The foul, the fair, the contrary, the kind,
As breezes rise and fall and billows swell,
Till on some jocund morn—lo land! and all is well."
Childe Harold, ii. 28.

CARDIGAN BAY TO TENBY.

Scarcely has the last glimpse of Bardsey faded from our view, than old Boreas, "gathering his brows, like gathering storm," puffed out his cheeks, and blew a fresh gale, and our little Nelly commenced performing those acrobatic feats which render her deck anything but a place of perfect repose. Yet, I remember when she has glided into the centre of this beautiful bay, in one of its calmest moods. When, in the bright, clear moonlight of a summer's night, the Snowdon range, and the bold promontory of Lleyn were seen in all their sublimity. There are few portions of our coasts, when viewed at a distance from land on the level of the placid sea, in the bright shadows of the rising moon, which present a more charming picture, than this noble range of mountains; their very outlines become distinct even to their lofty summits when radiant with light. But the sea has ever its charms, and never more so than in the calm dark shades of evening-tide. Then, as far as the eye can trace, its glassy surface gleams with phosphorescent lights, and as we slowly glide over it, every tiny ripple from our vessel's bow sends forth streams of living flame, and the iridescent colours of the Medusæ betray the presence of their floating forms. Professor T. Rymer Jones, speaking of the remarkable powers conferred on these abject forms of life—that of shining in the dark, with a phosphorescent splendour (surpassing even that of the Noctiluca) which, from their superior size, renders the jelly-fishes objects so conspicuous—as to excite our admiration even amid the galaxy of ocean stars by which they are surrounded.

"Any one," he says, "who, on a dark night, in the summer time, has watched the waves, reclining over the side of a steam boat, has doubtless often noticed the broad flakes of flame, which, kindled as it might appear by the rude shock of the revolving paddles, float astern, literally glowing with indignation. These fiery masses are in truth, Medusæ, rudely roused while 'peacefully slumbering on the ocean,' and testifying thus their flaming wrath at such disturbance."

It is in the summer months that immense fleets of the larger, and countless myriads of the smaller *Acalephœ* swarm our seas; and perhaps on no other portion of our shores, after they have passed the British channel, are they so varied in species or so countless in their numbers, as in the limits of this bay. The largest of the species, called the Great Rhizostomæ—*R Cuvieri* and the *Cyanea capillata*—indeed the most gigantic of all the Medusæ that swim the European seas, are often captured in these waters, while thousands are stranded on the shores.

The order of the *Acalephœ* comprehends a great variety of species, and these have formed the subject of one of the late lamented Professor Forbes's delightful monographs. The exquisite beauty and delineations of the figures cannot be excelled, and they amply testify to the versatility of his wonderful genius.

Some are so minute that it is only by the aid of the microscope that we can even detect their forms; others, as I have just said, grow to a gigantic size, often exceeding two feet in diameter.

Their forms are also various, as is their mode of locomotion, and their colours. Some are hemispherical, others orbicular; some are seen with long streaming tentacula, trailing behind them; others again are mere disks, with a curtain appendage, and no pendant tentacula. Some, as we have seen, propel themselves by the constant contraction and expansion of their umbrella disks; others, as in the *Cydippa pomiformis*, by their paddle-like plates. These two orders are distinguished by their peculiar mode of propelling themselves through the water. In the first, it has aptly been compared to the action of breathing performed by the lungs, and from this fancied similarity to the heavings of the chest, the general name of *Pulmonigrade* is applied to the whole of their order. The second order is named *Ciliograde*, because their progress is not by alternate contraction and expansion, but by means of the cilia-like paddles that fringe their bodies. But we have two other species, one of which is an inhabitant of our seas: the *Cirrhigrade*, of which the Valella is a type; and the second an occasional visitor—the *Physograde*—the well-known and dreaded Physalia, or the Portuguese Man-of-war. Their variation in colour is, perhaps, their most beautiful characteristic. Some are singularly beautiful, "exhibiting those symmetrical patterns produced by the kaleidoscope," and which defy our utmost efforts to portray. Then we find others brown in the centre, with sixteen lines pointing like radii to the circumference: some have a light purple cross in the middle, between each bar of which there is a peculiar semicircular mark, of deeper hue, from which diverge fainter coloured rays. Others again, we find, have this purple cross exchanged for one of white, with a deep black spot on each of its arms; and others have a disk almost pellucid as the water in which they swim, with a rich, ruby-like jewel in their crown. The hues of others, though so extremely minute, are still more beautiful. I have spoken of the power of the Medusæ to render the sea luminous with phosphorescent light. In our own seas the light emitted is extremely refulgent, and well-calculated to elicit admiration from the beholder; but its brilliancy is far surpassed in warmer latitudes. "If," says Spallanzani, "in the beginning of the night we enter the Strait of Messina, in a low boat, coasting near the land, where the water is perfectly calm, the Medusæ, usually very numerous there, begin to shine with a light which, as the darkness increases, acquires intensity and extent, every Medusæ resembling a bright torch, that may be seen for some hundreds of paces round, and on approaching it the brilliant phosphorescence shows distinctly the form of the creature's body." This light, when the evening twilight is extinct, is of a lively white, which strikes the eye, even when the animal is twenty-five feet or thirty below the surface. As the Medusæ, by its oscillation, transfers itself from place to place, so the light is variable. Sometimes it continues for a quarter of an hour, half an hour, or more; but at other times it suddenly becomes extinguished, and does not reappear until after a considerable interval.

Another very prominent feature in these animals is that from which they derive the English name of Sea Nettles—the power of stinging. The term Acalephæ, so generally applied to the whole of the Medusæ tribe, is significant of their nettle-like nature. Yet, it is not impossible that this offensive power of stinging is possessed only by a small minority of sea jellys—a minority chiefly composed of the *steganopthalmatous* species. Among them is *Cyanea capillata* of our seas, and the terror of tender skinned bathers. With its broad tawny foot, festooned and scallopped disk, often a full foot or more across, it flaps its way through the yielding waters, and drags after it a long train of ribband-like arms, and seemingly interminable tails, marking its course when far away from us. "Once tangled," says Forbes, "in its trailing hair, the unfortunate who has ventured across the monster's path, too soon writhes in prickly torture. Every struggle but binds the poisonous threads more firmly round his body, and then there is no escape; for when the winder of the fatal net finds his course impeded by the terrified victim wrestling in its coils, he, seeking no combat with the mightier biped, casts loose his envenomed arms and swims away. The amputated weapons, severed from the parent body, vent vengeance on the cause of their destruction, and sting as fiercely as if their original proprietor itself gave the word of attack."* Forbes states that only some of the higher class have the power of stinging severely, and that the power resides in the skin, especially in some of the appendages of the sub-umbrella, which appears to be always connected with the second or granular tissue. Wagner has attributed it to the filiferous vesicles, which in some species, if not in all, have the power of projecting the contained thread with its barbed extremities even as the hydroid Polypes and Actiniæ do.

But as many Medusæ and Actiniæ provided with these curious organs do not sting, such explanation is doubtful. I have never found any of the naked-eyed species to sting.

In the minds of most people who have been at the sea side the notion of a Medusæ naturally associates itself with that of a nettle, since the animal and the plant enjoy an equal reputation for their stinging powers, and for the production of an extremely similar, though not less unpleasant, sensation when incautiously handled, or inadvertently touched. With the aid of these powerful weapons, acting as the most successful of fishing lines, it has been generally considered the Medusæ obtained its food, and that shoals of not always the smaller fish were captured by these deadly venomous instruments. But that excellent naturalist, Mr. Peach, in some communications to the Linnean and other scientific societies, has thrown much doubt on this theory being correct; and the observations of so attentive and accurate a naturalist are alone sufficient testimony to place the circumstances related beyond a doubt.

Mr. Peach, writing from Peterhead, in the month of August, in which month the *Cyanea aurita* and *C. capillata* were so abundant in the harbour and bay as occasionally very much to inconvenience the fishermen, and render it difficult to lift the oars, especially of small boats, from among them. Round these Medusæ very small fishes were observed playing, sometimes sporting round *C. aurita*, and quitting it on a sudden for *C. capillata* when an enemy came near. Occasionally two or three might be seen attending one of the *Cyanea;* and when attacked or alarmed rushing under its umbrella, and among the tentacula, so as to shelter themselves in the large folds connected with the ova, where they remained until the danger had passed, and then again emerged to sport and play around their sheltering friend. When under the umbrella seeking shelter, they lay so close as to allow themselves to be taken into a bucket with the Medusæ, from beneath which, after a short time, they would come out and gambol as while in the sea. In this way Mr. Peach captured many young Whitings, measuring less than an inch to two and a half inches in length. It was evident that they resorted to the Medusæ for protection, and not, as sometimes stated, that they are preyed upon by these glass-like creatures; and it is probable that, with a view to greater security, they prefer the stinging species, with its eight bunches of long tentacula and large fringed ovaries, to the *Cyanea aurita,* with its single and frequently short row of delicate appendages. What then, asks Mr. Peach, becomes of the paralysing influence of the tentacles of this Medusa? This, he thinks, correctly opens a new field for observation. He believes, too, that the facts which he has observed, if not conclusive against, at least throw considerable doubt on the fish-eating propensities ascribed to the Medusæ; for he is convinced that in these instances the fishes resort to the Medusæ as to protectors and not enemies. In no instance did he observe a fish in the stomach of the Medusæ, but all were free to depart from its side when they pleased.

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* Frobes's Brit. Naked-eyed Medusæ.

Subsequent records in his journal state that a small Whiting, which was gliding round a small weak *Cyanea aurita,* was attacked by a young Pollack, whose movements it easily evaded by dodging round the Medusæ. A second Pollack, however, soon joined in the pursuit; both were for some time baffled, until an unlucky move drove the Whiting from its poor shelter, and a severe chase took place. The pursuers were joined by others, who followed like a pack of hounds, until the poor Whiting became exhausted, and was left by its enemies, who were unable to swallow it, to all appearance dead. In this state the tide gently drifted it along with the *Cyanea*, until, after a time, it recovered, swam slowly to its protector, and took refuge as before. The pack soon observed it, drove it again into open water, and this time succeeded in killing it. During their attack upon it, Mr. Peach repeatedly threw stones among them to induce them to desist; but so intent were they on the pursuit, that they dashed on unheedingly, although at any other time the smallest pebble would have alarmed and driven them aside. In another of his interesting communications to the Royal Institution of Cornwall, he mentions the capture of a minute Acaleph, which caught a Sagitta. "Whether," he says, "it had employed the Sagitta to remove a bone which it had in its throat, after one of its delicate repasts, as the Wolf did the Crane, or not, I am unable to say; if so, the Medusa was not so honourable as

MEDUSA.

the Wolf, for, despite all the exertions of the Sagitta to free itself, although the swallower's stomach was turned outwards during the struggle, it still refused to let the captive go; and the only difference that I could see was, the lips were pressed tighter round the head of his mouthful than before. No doubt, the dread of separation rendered his tight embrace necessary, the Medusa having met with a rough customer. This appears to me to be positive proof that the Medusæ prey upon other animals, and that they do not hesitate to attack those of large size if they fall in their way; for I cannot believe this intrusion into the stomach of the Medusa arose from any Paul-Pry accident on the part of the Sagitta. It was a fearful struggle, maintained with great obstinacy on both sides, and which I watched for a quarter of an hour. I left them at 2 a.m. hoping at daylight to see the result of the affair, but found that the vanquisher and the vanquished had both vanished, and left only a very minute granular wreck behind. This rapid destruction is not uncommon amongst the minute objects that swarm the sea; for as soon as the least sign of weakness falls upon them, or even a sign of decay takes place, the still smaller scavengers fall upon them, and in a very short time all trace of them is lost."

Until very recently, the mode in which the young of the *Acalephæ* are produced was totally unknown, or only very imperfectly surmised. Discoveries, however, have been made within the last few years by many of our eminent naturalists, which have greatly added to the interest with which they are regarded. Professor Jones gives us a very elaborate memoir of the production by the Medusæ of the Hydra Tuba, and, again, how the Hydra Tuba produce Medusæ. It appears that the Medusæ gives birth to a multitude of minute bodies, gelatinous like itself, and in shape somewhat oval, like the seeds of the sporules of some of the seaweeds, and clothed with clia, or hairs, that by their vibration propel them through the waters.

These buds, as they have been appropriately called, after a while fix themselves to some stationary object, and soon undergo a rapid transformation. The body, instead of retaining its oval form, becomes elongated, growing like a plant from the point by which it is attached, and increasing in width at its extremity. In this upper extremity a mouth is soon formed, surrounded by four prominences, which soon become long tentacula, like those of the sea anemones. When this process has reached a certain stage of maturity, the young Medusæ begin to be formed. Their earliest appearance is detected in the series of cups into which the stalk is divided. These cups are placed one within another, and have their edges divided into lobes. At length, in each of these cups, an independent life is developed. The upper one separates from the rest, and immediately begins to swim about by means of alternate contraction and dilatation peculiar to the parent Medusa. The second hemisphere soon follows the first, like a full blown flower from the stem on which it grew. And so the process goes on in succession; the juvenile Jelly-fishes set forth on their voyage through the waters as soap bubbles blown from a pipe wander through the air. Such is the wonderful mode in which these creatures are produced, and such, as I have faintly sketched, are the wonderful attributes conferred on the humble Jelly-fishes; "attributes," says Professor Jones, "so inexplicable, that the most learned physiologists are at a loss to explain the manner in which they are exercised. The body of a Medusa when submitted to chemical analysis is found to consist almost entirely of sea water. A specimen weighing four or five pounds, when allowed to drain away the fluid part of its substance, leaves a mere film of solid substance the weight of which is not so many grains; and yet the water of the ocean, thus imprisoned in a cobweb, we find moulded into forms of exquisite beauty—endowed with sense and motion—able to seize, to vanquish, and to swallow prey; to glow with phosphorescent light; and, lastly, to perpetuate their race by means as extraordinary as any other circumstance connected with their strange history."

But it is not alone to the Medusæ thus we owe the phosphorescent illumination of the sea. There are myriads of myriads of tiny living specks, so minute, that 30,000 of them have been calculated to be contained in a cubic foot of highly luminous sea water. This little glowing creature is known to naturalists by the name *Noctiluca* from *Nocte* by night, *luceo* I shine.

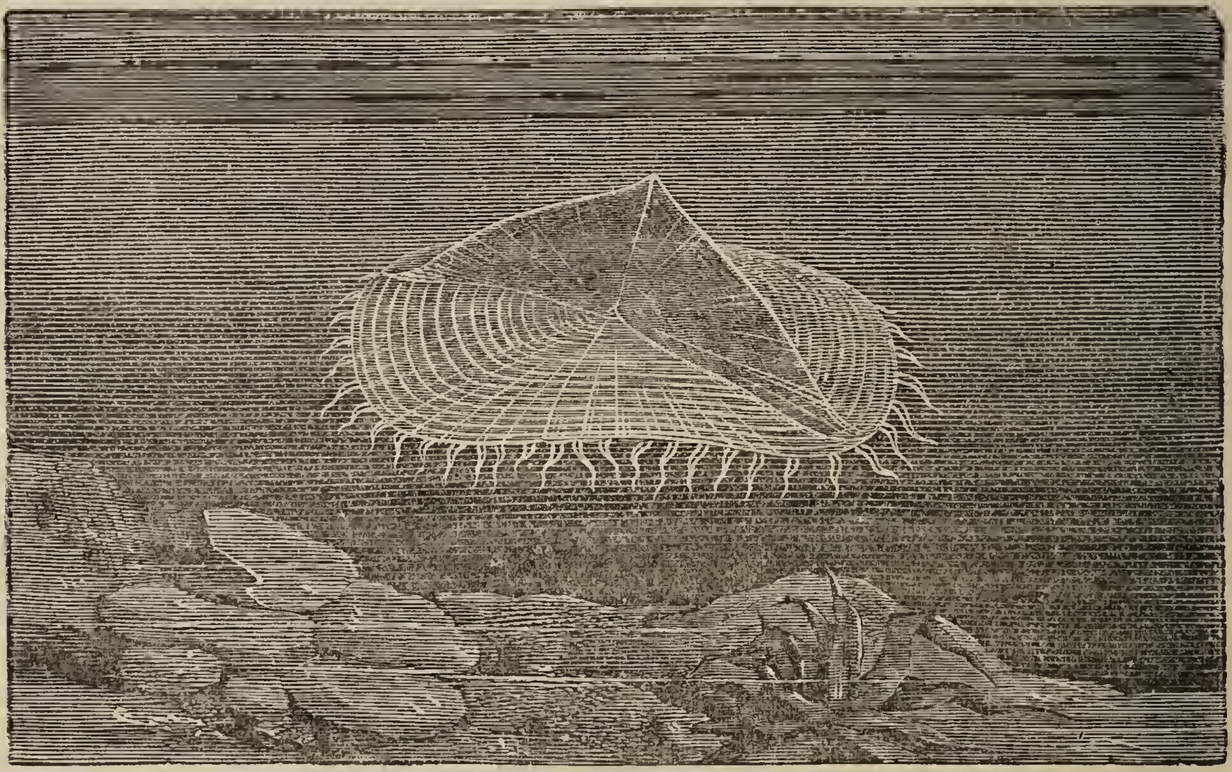
> "See, as they float along, the entangled weeds
> Slowly approach, upborn on bladdery beads;
> Wait till they land, and you shall then behold
> The fiery sparks those tangled fronds unfold—
> Myriads of living points; the unaided eye
> Can but the fire, and not the form descry.
> And now your view upon the ocean turn,
> And there the splendour of the waves discern:
> Cast but a stone, or strike them with an oar,
> And you shall flames within the deep explore;
> Or scoop the stream phosphoric as you stand,
> And the cold fire shall flash along your hand;
> When, lost in wonder, you shall walk and gaze
> On weeds that sparkle, and on waves that blaze."

Mr. Gosse, in enthusiastic language, writes of the delight he experienced when viewing, from Tenby Pier, the waves sparkling with flame produced by these minute creatures, and Rymer Jones says, "Few visitors to the seaside have not, at some time or other, but more especially during the summer season, had occasion to observe, while walking by night upon the shore, or else while enjoying the breeze upon some pier-head, or sea over-hanging cliff, a phenomenon as beautiful as it is astonishing. The waves, as they come rolling in, seemed fringed with fire; and when they break upon the shore, burst into liquid flame, which glides along, still spreading as it flows, until it laves the sand with light, and then, slowly retiring, leaves a track of shining sparkles glittering on the strand. If witnessed from a boat, or from a steamer's deck, the scene is still more wonderful: the heaving waves around appear to burn like phosphorus, emitting pale and ghostly splendour; the silent oars are raised, dripping with diamonds; or if a hand should be immersed in the refulgent waters and again withdrawn, the glowing sparks, like tiny stars, stick to its surface, or are shaken off in brilliant scintillations. The splashing wheels stir up a sheet of light; the wake of the vessel flames behind, as if it were the tail of some vast rocket in a fiery foam."

Philosophers have naturally been anxious to discover the *object* of this curious property of emitting light. "Meditating on this subject," says Mr. J. V. Patterson, "I think it not improbable that the Deity, who has done nothing in vain, and whose omniscience extends to every epoch, foreseeing that man would invent the means of tempting the trackless ocean, has given it as one means of rendering his nights less gloomy, and of diminishing the number of his dangers; especially if we consider that this luminosity is seen only in the night season, is vivid in proportion to the darkness, disappearing even before the feeble light of the moon; and also, that it increases with the agitation of the sea, that during the prevalence of storms it greatly diminishes the dense gloom which at such times is often impenetrable to moon or stars, throws such a light about the ship and rigging as to enable the sailors to execute their allotted tasks with certainty, and at all times, points out to the cautious mariner the lurking danger of sunken rocks, shoals, and unknown coasts by the phosphorescent or snowy appearance which it gives to the breakers, so as to render them visible at a considerable distance, or where certain forms of it appear, lets him know that he is within soundings, and probably at no great distance from some fatal spot."

> "Spangled with phosphoric fire
> As though the light rays there had spent their shafts
> And left the fragments glittering on the field."
>
> MONTGOMERY.

Morning, after a stormy run, finds us snugly lying in the inconvenient harbour of the antiquated, but much-improving town of Aberystwith. Next to the excellent facility for sea-bathing on a lovely beach, and first-class hotels, its attraction is its gem-spangled beach, where, on a fine summer's day, crowds of sea-side visitors, of all ranks and ages, are seen intently gathering the tide-worn pebbles, and the few dilapidated shells which are strewn here and there. That exquisite gems are sometimes found, a visit to some of the principal lapidists will satisfy the sceptical. Some of them really possess fine specimens of uncut stones, and no doubt, in their own estimation, and it may be also in the opinion of their customers, possess still finer gems of art in the cut and jewelled ones. But, preferring our diamonds in the rough, and having an eye towards Rome, we make our selection of the simplest, leaving the richly-mounted Bracelets, Necklets, Studs, Links, Seals, and Brooches for the lovers of the ornamental, and costly, as a memento of a summer's visit to this pleasant sea-side town. The tide, for naturalising purposes, is not favourable. The long and wide stretch of shingle and sand-beach is well-stocked with its usual occupants, a few species of marine animals, which inhabit that class of shore. At the southern extremity, a few boulder pools are found, and here and there the boulder clay and schist rock crops out, where a nice collection of the commonest, but still the most preferable of our Sea Anemones can be collected, with a few choice Molluscs, Annelides, and Enchinoderms. Doubtless, some of my readers, in passing the stall of the shell fishmonger, will have noticed that mussels, crabs, and lobsters are frequently partially encrusted with a small fluted conical, or acorn-shaped shell; the little creature inhabiting that tiny dwelling is not a multivale mollusc, as it was long supposed to be, but a Cirripedia, or curl-foot animal, known as the acorn-shell barnacle, *Balanus balanoides.* On the rocks and loose stones on this coast is another, which, in comparison with our familiar little acquaintance, is an over-grown giant, but still a member of the same family, and named the *Balanus porcatus.* The large size of its dwelling, which is an inch or so in diameter at the base, and about three-quarters of an inch in height, is, on the present occasion, a decided advantage, as it will enable us to examine the ingenious and wonderful mechanically constructed case occupied by the whole family. Some we have seen are not larger than a peppercorn, yet we find them as ingeniously and elaborately finished as the larger one before us. These shells, on superficial examination, appear as if constructed of one piece, but that is not the case; each shell is composed of several pieces, so placed together as to form, apparently, a firmly-united fluted cone, the broadest part of which is attached to the rock, or shell, which forms its abode. But neither is this the case, the shell-plates are only united at their base to the spot on which they rest, and each plate to the others by a thin elastic membrane. Now if we look at it during life under water we discover, a little below the rim near the top of the cone, some angular valves which meet with a straight suture, and close the interior. These are elegant folding doors, which, when submerged, the animal can open and shut with surprising rapidity and ease.



VELELLA.

Like the various kinds of Actiniæ, the Balina are entirely inactive when left by the tide; but no sooner are they again covered with water than they spring into activity, the folding doors revolve on their hinges, a *curl-foot*, or arm is thrust forth, a hand, I may say, of many fingers, resembling a plume of feathers, is spread out like a fine meshed net to catch its invisible food. This apparatus is adapted at once to the respiration and nutrition of the animal, and its structure, beautifully fitted for these purposes, affords a striking evidence of that marvellous skill which has been employed in the preservation even of the humblest living creatures, and to their mode of life, and the exigencies of their condition. "The food," says Rymer Jones, "devoured by the Cirripedes would seem to consist of various minute animals, generally of microscopic dimensions, caught in the water around them by a mechanism at once simple and elegant. Anyone who watches attentively the proceedings of a living Barnacle, when in a vigorous and active condition, will perceive that its arms, with their appended cirri, are in perpetual motion, being alternately thrown out and retracted with great rapidity; and that, when fully expanded, their plumose and flexible stems form an exquisitely beautiful apparatus admirably adapted to entangle any nutritious molecules or minute living creatures that may happen to be present in the circumscribed space over which this singular casting net is thrown, and drag them down into the vicinity of the mouth, where, being seized by the jaws, they are crushed and prepared for digestion. No sense but that of touch is required for the success of this singular mode of fishing, and the delicacy with which the tentacula perceive the slightest contact of a foreign body shows that they are eminently susceptible of tactile impressions. Nothing, indeed, can be more admirable than this unique apparatus, or more efficient for the intended purpose. It reminds the spectator at once of Ariosto's giant:—

'He 'mid the cruel horrors he intends,
Takes pleasure in a net, by cunning hands
Contrived, which near his mansion he extends;
So well conceal'd beneath the crumbling sands,
That whoso uninstructed thither wends
Naught of the subtle mischief understands,
Whom with loud laughter to his seat hard by
He drags along entangled in his snare;
Then having sucked their brains and life-blood dry,
Casts forth their bones upon the desert lair.'"

Our Nelly, or rather her sailing master, is so anxious to avail himself of the favourable wind, that he sadly interrupts me in endeavouring to trace a choice bit of ancient natural history, written by the sage Gerrard, in the sixteenth century. I need not trouble you, kind reader, to refer to Disraeli's Curiosities of Literature, nor either am I sure you would find it in that learned compilation. There is scarcely a work on popular natural history, but records, "But what our eyes have seen and our hands have touched we declare"—and then we have the full, true, and detailed account of a bird-bearing tree, growing at the "Pile of Foulders," which actually produced, so testify eye witnesses, the veritable Barnacle Goose, *Anas erythropus.*

> "So slow Bootes underneath him sees,
> In the Sky Isles, those Goslins hatch'd of Trees;
> Whose fruitful leaves falling into the water
> Are turned, they say, to living Fowls soon after:
> So rotten sides of broken ships do change
> To Barnacles; O Transformation strange!
> 'Twas first a green Tree, then a gallant Hull
> Lately a Mushroom, then a flying Gull."

I need not say, that the Cirripedes, found on the coast of Wales, must have sadly degenerated if they ever were members of this famous historical family.

Hoist sail and away, and in a few hours, with "a favouring gale," we have weathered the noble head of Saint Davids, and are busily engaged dredging in Saint Bride's bay, waiting the tide to permit us to have a peep at Ramsey, the northern island, and explore the more important twin islands at its south horn, Skomer and Skockham, otherwise Skokholme. Ramsey Island offers little inducement for the loss of a tide, not so the twin southern islands; and just at night-fall the brisk gale, that has been our friend all through the day, dwindled into a faint breeze, and then a dead calm. We drop anchor near the smaller island, at the only favourable spot we could find in the sound that separates the two islands; and I have very serious doubts (for our numbers have increased since our departure from the Menai) if ever such a marauding crew before landed on the little dot of land and rock. Be this as it may, the night is intensely hot, and our little Solomon the Wise sets us a laudable example. After having examined the lee side of a sand hillock, and expelled three or four generations of rabbits, he sculls the punt to the Nelly, and is soon seen landing, with his blanket over his shoulder, and quietly taking possession of the sand hole, doubtless preferring the open-air bivouac, under the canopy of heaven, to the close cabin of our little yacht. An immediate demand for blankets is made on our steward, and no sooner are they supplied, than we seek that calm restorer, balmy sleep, as though reposing under southern skies. Unfortunately, the morning's tide is not a favourable one, and, therefore, leaves us only a limited space for shore hunting.

The smaller island will not exceed more than two hundred acres in extent, and it pastures only a few sheep of a peculiar breed, and multitudes of rabbits. Its shores are very bold, but easy of access at numerous points, and at two in particular, named South and North Haven, where a landing can be effected at any hour of the tide. These little havens, and the surrounding rocks, abound in marine life, and I may say the same of the miniature coves of the sister isle, which is separated by a broad sound, at high water, about two miles in width. Skomer is of much greater extent, better cultivated, having a comfortable farmstead, and literally swarming with rabbits.

A few hours rambling over the rocks of these remarkable islets satisfied us that they abound with zoophytes and littoral molluscs, and that excellent dredging could be had in the Sound, if the visit were made when there was a good spring tide. Doubtless the marine zoology will be found identical with that of the neighbouring coast, St. Ann's Head being only about three miles distant, S.W. But there is always the hope, under favourable circumstances, and in a favourable locality, of discovering a new species, or, at least, a new variety; therefore, it is with reluctance we abandon for the present further search, and hoist sail, and direct our course for Milford Haven.

At almost the first haul near the mouth of the haven, amidst a medley of creatures, we have an interesting stranger, the Cloaklet Anemone and its Charioteer, and after two or three other tacks, other additions of the same loving couple, with a host of other forms of life. This summary sweeping of the sea bottom, in such a prolific locality, accumulates a marvellous store, almost sufficient to set up a little provincial museum. Brittle Stars and Urchins, bivalve and univalve Molluscs, Ascidians, smooth and warty; writhing Pipefish, and twining Worms, long tufts of Hydroid Zoophytes, Serpulas pipes, every one with its scarlet-crowned tenant; shoals of tiny fish, heaps of mossy Bryozoa, Shells covered with Cirripedes; and lovely Actinia. These, and multitudes beside, come up from the teeming sea-floor, and all at once claim our attention; and there is not one of the host that is not worthy of it.

But as we fully expect to meet with some of them at least many times during our wanderings, for the present we will leave them to devote our attention to the loving couple just mentioned.

That impudent, busy gentleman, the Hermit Crab, who so frequently intruded himself on our notice in the early part of our cruise, has a relative who inhabits deep water, and was first made known to naturalists by Mr. Prideaux, of Plymouth, hence its name *Pagurus Prideauxii.* Though attaining fully the size of his brother Bernhardus, he is a much slenderer and more elegant gentleman, and his colours—a light fawn, set off with soft tints of azure, lilac, and scarlet—are very attractive. In every character he is far more beautiful than the Bernhardus, not to speak of the technical characters which abundantly distinguish the two.

The constant companion of this elegant Hermit Crab is one of our most lovely Sea Anemones, tenanting the same shell. Therefore, wherever one goes, there also goes the other, living a life of friendship and peace. The late Professor Forbes stated he had dredged this beautiful Anemone, the Cloaklet—*Adamsia palliata*—off the Isle of Man, on the old shell of a Whelk, and that the crab was absent. My own experience corroborates that of Mr. Gosse, that this was accidental, and, doubtless, the iron lips of the dredge had dislodged or frightened the Pagurus. I have dredged, at different times, hundreds of this extraordinary pair of creatures, and, invariably, when the shell has been found untenanted, the crab has been found among the refuse of the dredge.

This extraordinary alliance, for many years, formed a source of interesting speculation, in what manner the due relation of size is maintained between the *Adamsia* and the shell in the progressive growth of the former. There is a manifest proportion between the two, the young Cloaklet occupying a small shell, such as the *Liltorina*, or *Trochus;* the full-grown individual a large one, such as that of *Natica*, or *Buccinum.* The Crab is able to shift from a smaller to a larger shell, when he needs enlarged accommodation; and since we know that his congener, *P. Bernhardus*, does it habitually, we naturally conclude that such is the habit of *P. Prideauxii.* Presuming, then, this to be the case, what becomes of the *Adamsia?* If the Crab shifts his quarters, and leaves the *Adamsia* behind, the association is broken, and we should constantly find *Paguri* without *Adamsia*, and *Adamsia* without *Paguri.* But we find neither one nor the other.

Here a series of important questions present themselves, which Mr. Gosse, with his usual patience and perseverance, satisfactorily solves :—" If the Anemone is able to shift its quarters, how does it proceed in its search for a new shell? If it forsakes the old tenement at the same time as the Crab, and together with it takes possession of the new one, by what means is unity of will and action secured? What communication of thought takes place from one to the other? As the Adamsia does not adhere to the Crab, but to the shell, that is, as they are independent of each other's movements, who takes the initiative? Who goes to seek the lodging? And at what point of the transaction does the other come in?" We will now turn to our captive, and then seek the solution of those questions so admirably advanced. The Cloaklet, *Adamsia palliata*, is an Anemone of the *Sagartia* family, whose habitat in deep water extends to nearly every portion of the British coast. There are two known varieties, if not a third, and they are found of every size, inhabiting the smallest shell, in company with the infant Crab. One variety, frequently found off the Isle of Man, occupies the joint tenancy of the full-grown shell of the *Fusus Antiguus*, beautiful in their colours, and remarkable in their form. The one before me, *Var Rodopis*, is generally reddish-brown on the outer (lower) part of its body, which hue melts into snowy white on the upper parts. The whole is studded with rosy-purple spots, and surmounted by a marginal line of pale scarlet. The tentacles and disk are pure white. It attains, as before named, a rather large size, and has the peculiarity of being not round in its basal outline, like other Anemones, but oblong, the base expanding in two lateral directions. It always selects the inner lip of a univalve shell for its place of residence, and the two lateral ends gradually extend round the mouth of the shell, till they meet on the outer edge, and unite with a suture : thus, the outline of the animal forms a ring."

Mr. Gosse dredged, in Torbay, a specimen of Adamsia, about half grown, on a small shell of *Natica monilifera*, tenanted by a Pagurus Prideauxii, which seemed already too big for his habitation. They were placed in a tank in excellent condition. Both continued in the highest health for about three months. At the expiration of that period, the Anemone was not looking so well, and had loosed one wing of its base from the shell; and the Crab shewed manifest symptoms of the uncomfortable smallness of his house, by the great extrusion of his foreparts, so great, indeed, as to expose even the front of his soft abdomen. "I felt a reluctance," says Mr. Gosse, "to present to the Crab a larger shell, fearing he would, in availing himself of it, desert his zoophyte friend, which would then die, and I should lose the specimen."

But, considering the solving of a difficult problem better than a specimen, he placed a full-grown *Natica* shell on the floor of the tank, not far from the disconsolate pair.

"The *Pagurus*," he tells us, "presently found the new shell, and immediately began to overhaul it. He did not do, however, as his brother Bernhard would have done, at once shift into his new house. Having turned it mouth upwards, he took hold of the outer and inner lip, each with a claw, and began to drag it about the tank. Occasionally he relinquished the hold of one claw, and probed the interior in the usual manner, and then resumed his march. I watched the proceedings for an hour or more, then, having other work to do, I left him alone. The thought did occur to me—Can this be intended to make the Adamsia cognisant of what is in contemplation, and to prepare it for the change?

"After about an hour's absence, I returned to the examination. The Pagurus was comfortably lodged in his new abode, and the old one lay deserted at some distance. I eagerly turned the latter over to see what condition the Adamsia was left in. Lo! no Adamsia was there; and the Pagurus presently approaching the front of the tank, I saw, to my great satisfaction, that the old association was unbroken. There was the Adamsia, with the one wing adhering to the lip of the new shell, and apparently the opposite wing also. Examining now more closely the condition of things with a lens, I saw that the central part of the Anemone's base was adherent, by a small point of its surface, to the under side of the thorax of the Crab, between the bases of the legs."

This adhesion was so unusual a circumstance, that Mr. Gosse concluded it must be as a temporary provision for the removal of the Adamsia from the old shell to the new one, and for the correct adjustment of its position on the latter. "How can we avoid," he says, "the conclusion, that as soon as the Crab had found the new shell to be suitable for exchange, the Adamsia also was made cognisant of the same fact; and that, during the two hours which followed, the latter loosened its adhesion to the old shell, and laying hold of the bosom of his friend, by him was carried to the new house?"

On more than one occasion, the Anemone being evidently in bad health, while the Crab was evidently in clover, the former became detached from the shell, and was then restored again to its position by the Crab, the pincer-claws being the active instruments; and, from this fact, Mr. Gosse reasonably concludes that the Crab is certainly the more active promoter of the partnership: it is abundantly evident that he values the company of his elegant but very heterogeneous associate. The last observation compels the conclusion that the claws of the Crab are always employed in the transference of the Cloaklet from shell to shell.*

But what a series of instincts does this series of facts open to us! The knowledge of the Crab of the new shell; the delay of his own satisfaction till his associate is ready; the power of communicating the fact to her; her immediate obedience to the intimation; her relinquishment of her wonted hold, which for months, at least, had never been interrupted; her simultaneous taking of a new unwonted hold, where alone it could be of any use; the concerted action of both; the removal; her relinquishment of the transitory adhesion as soon as its purpose was accomplished; her simultaneous grasp of the new shell in the proper places; all these are wonderful to contemplate; wonderful, considered singly, far more wonderful in their cumulation. Is there not here much more than what our modern physiologists are prone to call automatic movements, the result of reflex sensorial action. The more I study the lower animals, the more firmly am I persuaded of the existence in them of psychical faculties, such as consciousness, intelligence, will, choice! That even in those forms in which, as yet, no nervous centres have been found.

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* Zoologist (p. 6,580). 1859.

Again the dark shadows of evening speak the coming night. Our remembrance of the grand marine caverns of Anglesey—"the work of a thousand storms"—are ever present before us. On this coast we find them, if not so majestically, more frequently repeated, divided into thousands of chasms, creeks, crevices, and noble headlands; and as we, in the deep gloom of night, pass the dark shadow of the massive Saint Gowan, the towering Castle, or Stack Rock—its feathered life now still as the gentle wave that laves its base—each opening scene, as we glide from point to point into the romantic little Bay of Lindstep, each moment revealing to our enraptured gaze some sublime evidence of the mighty power of Him who is all love and beneficence, we exclaim with the poet—

> "When round Thy wondrous works below
> My searching rapturous glance I throw,
> Tracing out wisdom, power, and love,
> In earth and sky, in stream, or grove—
> Let not my heart within me learn,
> Except in all I Thee discern."
>
> KEBLE.

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